TAMPERE UNIVERSITY OF TECHNOLOGY

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USER EXPERIENCE AS A BASIS FOR MANAGEMENT DECISION MAKING PROCESSES

Master of Science Thesis

Prof. Saku Mäkinen and Assoc. Prof. Marko Seppänen have been appointed as the examiners at the Council Meeting of the Faculty of Business and Technology Management on the 5th of September, 2012.

ABSTRACT

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The main objective of this thesis was to study the influence that user-centric design has on the management of product development processes. The goal was to identify how the success factors for project management can be adapted to the industrial context of complex systems. Furthermore, the aim was to study how the value of user experience can be delivered towards the customer surface. The main objective was approached with theoretical and empirical analysis. A literature review was conducted to distinguish the success factors in user experience related development projects. Qualitative interviews with two case companies and their customer representatives were held to bring a practical viewpoint on the studied phenomenon in a complex systems environment.

As a result of the study, some implications could be drawn. Regarding the applicability of the success factors, the results indicated that a substantial amount of project management success factors can also be applied to the user experience environment within complex systems. These can be mostly understood as fundamental competitive factors for an organization. For example, involving senior management and representatives from different divisions to the development project will help creating a joint understanding of the value of the system's aspects. The value of certain management practices was seen to differ in the research context, reflecting with the characteristics of complex systems. Concrete prototypes are seen particularly effective to make a solid understanding of the value of user experience. Instead of involving customers in all product development phases, a more effective approach in the earlier stages is to utilize a collective customer feedback method.

The customers in the industrial context do not place a high value on the hedonic aspects, but rather focus on rational and service-based aspects. When aiming to make an impact with user experience, the management should expand their offering beyond the actual product towards a service based experience model. As an implication of the findings, a modified version of the project management success factors was presented to the industrial context of complex systems.

TIIVISTELMÄ

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Tämän diplomityön aiheena oli tutkia käyttäjälähtöisen suunnittelun vaikutusta tuotekehitysprosesseiden johtamiseen. Tavoitteena oli tutkia, kuinka projektijohtamisen kriittiset menestystekijät pystytään mukauttamaan kompleksisten systeemien kontekstiin. Tavoitteena oli lisäksi analysoida, miten käyttäjäkokemuksen arvoa pystytään viestittämään asiakkaalle päin. Teoreettinen analyysi keskittyi tunnistamaan projektijohtamisen menestystekijät projekteissa, joissa käyttäjäkokemus on kehityksessä olennaisessa roolissa. Työn empiirisessä vaiheessa ilmiötä tutkittiin teollisten koneiden liiketoimintaympäristössä kahden case-yrityksen sekä heidän asiakasyritysten haastatteluaineiston pohjalta.

Tulosten mukaan merkittävä osa projektijohtamisen menestystekijöistä pystytään mukauttamaan käyttäjälähtöiseen kompleksisten systeemien kontekstiin. Näistä tekijöistä useimmat ovat luonteeltaan organisaation kilpailukyvyn kulmakiviä. Esimerkiksi korkeimman johdon sekä yrityksen eri divisioonien edustajien sitouttaminen projektiin edesauttavat käyttäjäkeskeisten aspektien ymmärryksen kehittämisessä. Tietyt johtamisen vaikuttamiskeinot erosivat tässä tutkimuksessa aikaisempiin havaintoihin verrattuna, mukaillen kompleksisten systeemien luonnetta. Konkreettiset esimerkit nähdään erityisen tehokkaaksi luomaan käsitys käyttäjäkokemuksen arvosta. Tätä vastoin asiakastiedon keräys on tuotekehitysprosessien alkuvaiheissa tehokkainta suorittaa sisäisen kollektiivisen keräysprosessin avulla asiakkaiden kokonaisvaltaisen sisällyttämisen sijasta.

Kompleksisten systeemien toimialan asiakasyritykset arvostavat hedonisten ominaisuuksien sijasta enemmän tuotteen toiminnallisuutta kehittäviä ominaisuuksia ja palveluita. Jos yritys haluaa luoda itselleen kilpailuedun käyttäjäkokemuksen avulla, sen tulisi tuotteen käytettävyyden sijasta laajentaa tarjoamaansa palvelukeskeiseen toimintamalliin. Tulosten pohjalta projektijohtamisen menestystekijöiden teoreettista viitekehystä muokattiin sopimaan kompleksisten systeemien kontekstiin.

PREFACE

"Now you're looking for the secret. But you won't find it because of course, you're not really looking. You don't really want to work it out. You want to be fooled."

CITER. Office room renovation. Lunch discussions. Oatmeal with coconut oil. London's Olympics. Gangnam Style. As I recall my writing process of my diploma thesis in this specific moment, those words are the first things that come to my mind. And I honestly think that these words describe the last eight months of my life rather accurately. Even though the concrete results are summed up in a paper form, there are a ton of other factors that I felt were too abstract or irrelevant to write down but yet had a solid impact on the outcome.

From the beginning of the process I felt amazed of how sincerely active supporting my fellow research colleagues were towards me. I owe my greatest thanks to my advisors Associate Professor Marko Seppänen and Professor Saku Mäkinen, who actively guided me throughout my process. Besides giving great assistance, they gave valuable feedback that made me rethink many aspects of my work.

I would like to express a special gratitude to Hanna-Riikka Kuokkala - my colleague in the same UXUS program who was extremely helpful to me. You were just sitting way too near to me to avoid receiving a continuous flow of requests. A big thank-you goes also to Fastems and KONE representatives for sparing their valuable time for my interviews, and to all of my colleagues at CITER, who both helped me in my questions and made my working process an unforgettable experience.

Tampere, 4th of January 3, 2013

Kalle Ollberg

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ABBREVIATIONS AND NOTATION

CoPS	Complex Systems
CSF	Critical Success Factor
CX	Customer Experience
FIMECC	Finnish Metals and Engineering Competence Cluster
HCD	Human-Centered Design
HCI	Human-Computer Interaction
IT	Information Technology
NC	Numerical Control
NPD	New Product Development
ROI	Return on Investment
UCD	User-Centered Design
UX	User Experience

1 INTRODUCTION

Technology has revolutionized the way people conduct business, expanded market places, and created a multitude of business opportunities. As a result, end users have never been so sophisticated with respect to the products they use. (Sward & Macarthur, 2007, p. 35.) In various industry sectors, the technical reliability of products is taken for granted and users start to prefer products that provide engaging user experience (UX) (Pine & Gilmore, 1999). This has created the need to utilize UX more effectively in product development processes. Implementing a usability strategy to the product development process has become mandatory in order to gain a competitive edge in the marketplace. (Schaffer, 2004; Venturi & Troost, 2004.)

Besides examples in commercial good producers, user experience started to be a significant source of competitive advantage also in the context of industrial systems (Hecker & Berger, 2011, p. 427). Unprecedented IT investment levels have overwhelmed enterprise software users during the recent years. As a result, effective usage rates have stalled and end user productivity loss is averaging 17%, outweighing a company's entire IT spend (Oracle, 2012, p. 3). These kinds of results have radically changed what UX professionals design today, and how the final experience to the user is delivered (Rosenberg & Kumar, 2011, p. 36). Customers will expect good usability, making it just one more requirement for being in business (Schaffer, 2004, p. 254).

The role of strategic and functional level executives is seen crucial in product development processes. Even though they are typically not directly involved in the design process, they act as decision makers in project review points, making continuation decisions, prioritizing projects between each other, and making critical resource commitments. (Cooper, 1994; Schaffer, 2004; Meyer & Schwager, 2007.) It is seen that only by involving a person with sufficient decision power in the development process, UX is able to make a greater impact on the organization which will further make it possible to include UX as one of the key competences of a company (Sazonov, 2011; Škrabálek et al., 2011).

Recent literature has been focused on defining, measuring and understanding user experience (e.g. Hassenzahl, 2008; Karapanos et al., 2009; Law et al., 2009; Yu & Tao, 2009), while other studies concentrate on pointing out the best practices in usability design (e.g. Schaffer, 2004; Hassenzahl, 2008; Feng Zhou et al., 2012). Despite of the noted importance of the role of management in UX development processes, the results analyzing the link between perceived UX and management decision-making are scarce

(Schaffer, 2004; Venturi & Troost, 2004; Väänänen-Vainio-Mattila et al., 2008a). Literature has expressed a need to study the influence of employee and management to user and customer experience (e.g. Verhoef et al., 2009). This thesis aims at answering this question by analyzing how user-centered design affects the management of product design processes in complex systems environment.

The impacts of enabling a connection between management and user experience are threefold:

firstly, UX related success factors can be distributed to company operations more effectively;

secondly, the companies can distinguish themselves better in their marketplace with user experience;

finally, UX can help companies discover new ways to meet a users' and customers' desired value.

As a consequence, the results of the thesis give valuable insight of how companies can benefit from user experience as a source of competitive advantage.

1.1 Research question and objectives

The purpose of this diploma thesis is to study the influence that user-centric design (UCD) approach has on the management of product development processes of complex systems. The aim is to identify the UX related goals, which have influenced the behaviour and practices of strategic and functional level executives. These practices include the motivational, cognitive and positional based aspects of the manager as well as the actual transformation of the development process. Furthermore, the goal is to find out how UCD practices affect sales process of the product and the product's perceived value by the customer company.

Due to the nature of complex systems and the chosen case companies, the focus on this thesis will be in B2B context and more specifically within industrial complex systems. The objectives of the research are derived from the needs of the larger Finnish Metals and Engineering Competence Cluster (FIMECC) research program "User Experience & Usability in Complex Systems (UXUS)" where the results are utilized in order to create extensive understanding of user and customer experience in complex systems.

The main research question has two aspects. Firstly, it defines the substance of the study. Secondly, the form of the question defines how to approach the research methodologically (Yin, 2009, p. 10.) Thus, the research question should be selected and defined carefully. The main research question of the thesis is:

What effects does user-centric design have on the management of product development processes in the context of complex systems?

To answer this question, the research objectives of this thesis include multiple aspects of user experience management. More specifically, the goal is to distinguish how the success factors of project management can be adapted to UCD approach and to complex systems. The first research objective is:

O1: Study the effects that user-centric design has on project management success factors

The second research theme relates to studying the impacts of management practices to the sales and purchasing processes of the system. The aim is to explore the influences that user centered design aspects have on the sales and purchasing processes of the system. Hence, the perceived value in the system's value chain will act as the metrics to evaluate the effects of each project management success factor. Moreover, the aim is to provide a reflection of the success factors' concrete impacts to the perceived value of the product. The second research objective is:

O2: Study how user-centric design reflects to the product's perceived value in the sales process of the system

A literature review is conducted in order to identify the elements of user-centric design that are seen to have an impact in the management and transformation of development processes. Furthermore, the aim is to distinguish the success factors between project management literature and UX related project management literature. Comparing the results of project management in general and project management in user-centric design processes will help pointing out the similarities and differences of the success factors between these two research contexts.

There does not exist any general listing of the success factors within UX literature. Thus, most available data is currently coming from individual case results. Consequently, a review of the key elements of user experience management is justified and valuable to make. The main findings from the literature review will be reflected to the findings from the two case companies in the Finnish Metal and Engineering Industry (MEI) within this study, Fastems Oy Ab and KONE Oyj. The findings will be derived from the interviews made with the case company representatives in research and development (R&D) and sales and marketing (S&M) divisions and the company's senior management. Moreover, information regarding the perceived value of the system will be drawn either from the S&M representatives' point of view or from interviews with customer company representatives.

As the result of this comparison, some findings regarding the success factors of project management in user-centric design process can be pointed out. The goal is to have a

better characterization of the aspects of user-centric design that have an impact in the managerial decisions and distinguish the factors that are seen to have a positive impact to the perceived user experience value of the system.

1.2 Research approach and methodology

The multidimensional nature of the research makes it challenging to categorize the proper research approach. Regarding the theoretical part, an investigation of existing literature is made with the aim to propose a theoretical concept to suit the research requirements of this thesis. The empirical part of this study includes two cases that are carefully selected to meet the project requirements. The purpose of this study is to evaluate the studied phenomenon within the chosen events by reflecting the proposed theoretical concept to the industrial context of the case firms.

A case study approach was selected due to the nature of the research. Case study is a research approach that focuses on understanding the dynamics present within single settings (Eisenhardt, 1989). Case studies are also recognized as being especially valuable in explorative research looking for new variables and relationships not conceived of in the original theory (McCutcheon & Meredith, 1993). The case approach suits particularly well in this study since the concept of user experience is relatively new and it has not been researched intensively especially in management sciences. Moreover, case studies can be used to reflecting and testing the theory to empirical evidences (Pinfield, 1986).

A case study requires empirical evidence to prove its results (Eisenhardt, 1989, p. 534). An interview method was considered to suit best to the chosen research approach. Semi-structured interviews are used to gather data, which are analyzed qualitatively, as a part of a case study strategy. These data are seen to not only reveal and understand the "what" and the "how" but also to place more emphasis on exploring the "why". (Saunders et al., 2009, p. 321.) On obtaining qualitative data, interviews were considered the most advantageous approach for this thesis. Interviews are recommended, when there are a large number of questions to be answered, when the questions are either complex or open-ended, and when the order and logic of questioning may need to be varied (Easterby-Smith et al., 2008). Using semi-structured qualitative interviews is particularly beneficial in studies like this where there is an exploratory element involved (Blumberg et al., 2008). In this interview method the interviewer commences with a set of interview themes. The order of the questions and themes can be varied in the context of the research situation or organizational events. Additionally, new questions can be asked. (Saunders et al., 2009, p. 601).

This study will be approached with qualitative methods. Yin (2009) argues that there are two different approaches to analyze qualitative data. The first approach called the

deductive approach means that the existing literature is used to formulate the research question and objectives. This approach may involve exploring the literature to compile a framework. Furthermore, the framework is typically tested with qualitative data. The other research approach is inductive approach. In this approach the collected data instead of existing literature is typically used to find the relevant issues and results. Thus, inductive approach is merely based on empirical data. (Saunders et al., 2009, p. 320.)

A literature review is conducted in order to craft the framework to be used in the research. The framework will be tested within the empirical cases to analyze its applicability to the industry context of this research. Since the basis and outcomes of the research are mainly aligned towards practical and empirical purposes, this research is leaned towards an inductive approach.

The goal of this research is not to construct new theory, which would describe the particular phenomenon in general. This kind of basic research would require more cases and comparison between them, or even a different research method (Eisenhardt, 1989). Consequently, the aim is to give a better understanding of the studied phenomenon with the support of the given empirical and theoretical results. Since this study comprises of only two cases, the results are not appropriate universally but merely for the particular cases. Therefore, this study should focus on the normative analysis. Moreover, focusing on two similar cases gives the opportunity to have rich qualitative data from a particular phenomenon which may be utilized in further researches covering similar themes.

1.3 Structure of the thesis

The structure of this thesis shares many aspects to the general structure of case studies. An initial definition of the research question is important in building theory. Building a constructive theory and analyzing it with the collected and analyzed data are also found essential in case studies. (Eisenhardt, 1989, pp. 536-546.) The structure of the thesis is visualized in Figure 1.

The first chapter of the study introduced the research topic and states the research questions, objectives and structure. The introduction is followed by literature review, which consists of sub-chapters focused on introducing user experience, project management success factors, and a user-centered design process.

The dynamic field of user experience is presented to create a solid understanding of the research field for the rest of the chapter and the thesis. In addition, the industrial context of complex system is presented to understand the industrial focus of this thesis. A theoretical framework is presented to introduce the success factors on traditional project management. Furthermore, a literature review for distinguishing the critical success

factors in UX related development projects is conducted. As a result of this comparison, a framework for depicting the phenomenon in UX context is presented.

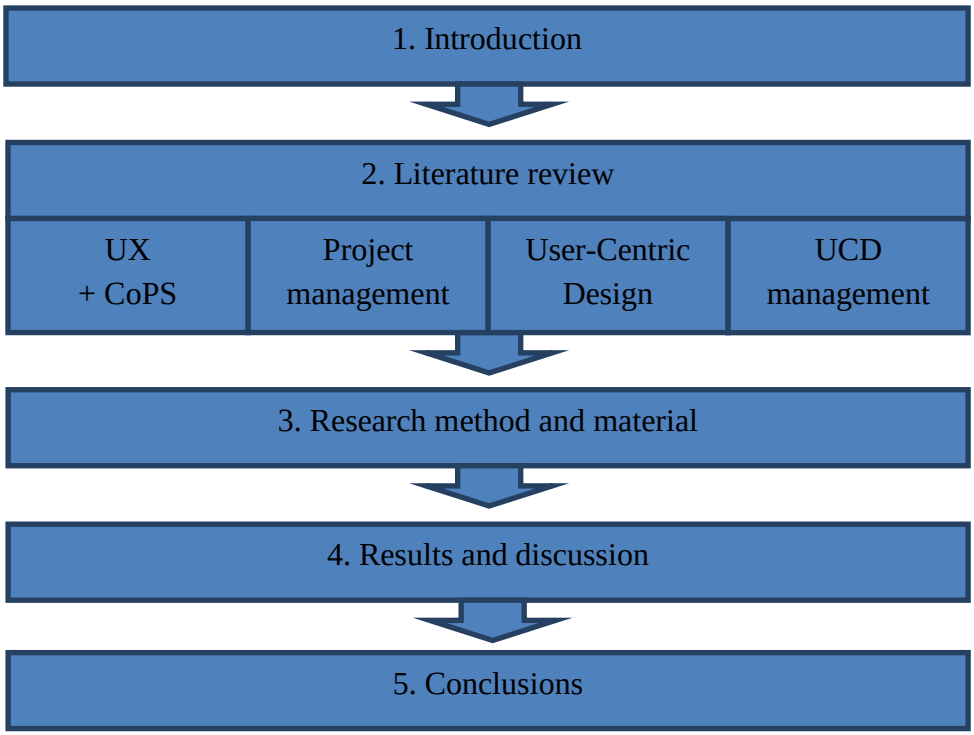

Figure 1. The structure of the thesis

The third chapter focuses on the research method and the case companies. The first sub-chapter focuses on presenting and analyzing the case method and research material. Within this chapter the material collection, the interview method and the material analysis will be discussed. The other sub-chapter focuses on presenting the two case companies and making a comparison between the case contexts.

The fourth chapter deals with the results of the research. The research results from each case are summarized in a narrated form. In the synthesis of the case results the empirical findings are reflected to the theoretical results presented earlier in chapter two. Furthermore, the significance of the results will be compared with previous literature findings to see how user-centric project management success factors apply to the context of complex systems. An adjusted theoretical framework for project management success factors will be presented for complex systems environment. The discussion chapter continues this dialogue by giving a tentative UX toolkit for companies in complex systems environment.

The fifth and final chapter withholds the main implications from both academic and management perspectives. Moreover, the credibility and reliability of the research will be discussed. Finally, some implications for possible future research suggestions are made.

2 THEORY

"Every great magic trick consists of three parts or acts. The first part is called "The Pledge". The magician shows you something ordinary: a deck of cards, a bird or a man. He shows you this object. Perhaps he asks you to inspect it to see if it is indeed real, unaltered, normal. But of course... it probably isn't."

2.1 The value of the user experience

2.1.1 Definition of user experience

Before the role and influence of strategic decisions in the product's user experience factors can be developed, the term user experience, often described as UX, should be explained. Additionally, findings on the strategic value of UX are presented in order to understand the business significance of UX to the firms in terms of competitive advantage.

User experience is a challenge due to its multifaceted nature. Today it seems that researchers as well as practitioners have become well aware of the limitations of the traditional usability framework, which focuses primarily on user cognition and user performance in human-technology interaction (HCI) (Hassenzahl, 2010; Sazonov, 2011, p. 6). Nevertheless, due to the wide gap between practitioners and academics in their own area, a widely accepted, shared understanding of UX is still lacking (Hassenzahl, 2008, p. 11). For a long time, it has been studied by psychologists, sociologists and philosophers, and seen as a key asset for instance in marketing and product design – however, speaking in academic sense, the term has remained "fuzzy" and undefined. (Hellman & Rönkkö, 2008, p. 12; Arhippainen, 2009, p. 19.)

As argued by Law et al. (2009.), it is associated with a broad range of dynamic variables, which are included or excluded depending on the author's background and interest. The landscape of UX research is fragmented by diverse theoretical models with different foci such as pragmatism, emotion, affect, experience, value, hedonic quality etc. (Karat, 1997; Forlizzi & Ford, 2000; Lockwood, 2009; Karapanos et al., 2010). In addition, the unit of analysis of UX ranges from a single aspect of an individual end user's interaction with a standalone application to all aspects of multiple end users' interactions and its merging of services from multiple disciplines (Sward, 2006).

An important step to clear the challenges of the academic communities regarding the definition of UX, International Organization for Standardization (ISO, 2010) defined the term user experience as:

- Person's perceptions and responses resulting from the use and/or anticipated use of a product, system or service.

- User experience includes all the users' emotions, beliefs, preferences, perceptions, physical and psychological responses, behaviors and accomplishments that occur before, during and after use.

- User experience is a consequence of brand image, presentation, functionality, system performance, interactive behaviour and assistive capabilities of the interactive system, the user's internal and physical state resulting from prior experiences, attitudes, skills and personality, and the context of use.

- Usability, when interpreted from the perspective of the users' personal goals, can include the kind of perceptual and emotional aspects typically associated with user experience. Usability criteria can be used to assess aspects of user experience.

Regarding UX in industrial context, Charles Carver and Michael Scheier (2001) studied the goals of product usability and quality in use among organizations and end users. They concluded that the organizational goals are typically related to the achievement of certain tasks. On the other hand, for the end users there are not only pragmatic task-related "do" goals, but also hedonic "be" goals, such as stimulation, identification and pleasure (Carver & Scheier, 2001). Later literature supports this with similar findings and argues that the fulfillment of basic human needs is the driver of the hedonic experiences (Hassenzahl, 2008, p. 12; Bevan, 2009, p. 8).

Hassenzahl (2008, p. 12) points out the dynamic nature of UX. The actual use of a product is often quite short and dependent on the present phenomenon and subjective factors. Law et al. (2009) show similar results and emphasize context-dependent factors of the concept. The temporal nature of UX is highlighted also in other studies as the user's experiences have been found to develop over time (Karapanos et al., 2009; Karapanos et al., 2010).

As an attempt to integrate some of the findings in literature, Nigel Bevan (2009, p. 7) displays how the measures of effectiveness, resources, safety and satisfactions can be selected the measure the system's quality in use from the perspective of different stakeholders. Following the findings of Baraldi (2010), expressing UX through multiple perspectives is valuable in the context of complex systems since the products are often

linked to multiple stakeholders in the organization. The different perspectives are illustrated in table 1.

Table 1. Stakeholder perspectives of quality in use (Bevan, 2009*)*

STAKEHOLDER:	**End User** *Usability*	**Usage Organisation** *Cost-effectiveness*	**Technical support** *Maintenance*
GOAL: **MEASURES**	Pragmatic and hedonic goals	Task goals	Support goals
Effectiveness	User effectiveness	Task effectiveness	Support effectiveness
Resources	Productivity (time)	Cost efficiency (money)	Support cost
Satisfaction	Hedonic and pragmatic satisfaction	Management satisfaction	Support satisfaction
Flexibility	Individualisation	Customisation	Adaptability
Safety	Risk to user (health and safety)	Commercial risk	System failure or corruption

Compared to other UX studies (e.g. Hassenzahl, 2008; Karapanos et al., 2009; Law et al., 2009), Bevan (2009) broadens the view of context to be assessed by product flexibility and includes the term safety to measure the potential negative outcomes that could result from incomplete or incorrect output. Resulting from the findings of Bevan (2009) and Baraldi (2010), the role of the usage organization plays a major role in the user experience validation in complex systems. Instead of valuating individual pragmatic and hedonic goals, the factors affecting the buying decision often relate to more money-related factors, such as the cost-effectiveness and maintenance usability of the system.

The aspects above emphasize couple of processes that are seen to have a great importance in understanding the formulation of UX among people and industrial organizations. As discussed, literature tends to agree it to be dynamic, context-dependent and subjective, which stems from a broad range of potential benefits users may derive from a product. It includes pragmatic task related do-goals as well as hedonic be-goals which relate to the question how well the product supports the personal goals of the person itself. Besides the end user, the impact of UX is measured by the point of view of the usage organizations and the technical support as well. This should be taken into account during the design and sales of industrial machines such as complex systems. UX is seen as something new, which must be a part of the HCI domain and be grounded in User-Centered Design (UCD) practices (Law et al., 2009, p. 727).

2.1.2 Strategic value of user experience

An overview of the findings on the strategic value of UX is worthwhile to make in order to understand the concrete benefits of user experience. Literature findings will be compared with the aim to draw general results as well as more specific conclusions in the business context of this research.

The business benefits of UX have been proven to exist in both B2C and B2B context (e.g. Mayhew, 1994; Vredenburg et al., 2002; Schaffer, 2004; Boivie et al., 2006; Garrett, 2006; Sazonov, 2011). One of the first definitions of the impact of usability at strategic business level was expressed by Deborah Mayhew (1994) as "business benefits of usability", such as:

- Reduced training time
- Better system acceptance
- Savings in support costs
- No need of a user manual, or a smaller one
- Improved efficiency of users' work
- Better user satisfaction
- Savings in development costs

Despite the noted advantage of UX to business, the specific benefits vary significantly between different authors. Garrett (2006, p. 36) argues that UX is the most significant factor in building customer loyalty, as customers become loyal because of the positive experiences they have with the company. Keefer (2009) adds that investing in UX can decrease remarkably product's time-to-market and costs in product development. Some authors rise the importance of UX from just the technological perspectives to stand as one of the strategic business advantages (e.g. Pine & Gilmore, 1999) which will result in increased sales or enrollment, more leads, customers' increased willingness to pay fees and larger sets of items per purchase and so on (Schaffer, 2004, p. 4). On the other end, Vredenburg et al. (2002) did not get conclusive results regarding whether UX had led to savings in development time and costs across all organizations.

The exact reasons for the varying results are difficult to determine. As discussed by Law et al. (2009), the broad range of fuzzy and dynamic concepts associated with UX could explain part of the variation. Vredenburg et al. (2002, p. 475) got similar findings by concluding that their target group did not focus on the correct measures when calculating the savings in development time and costs of UX processes and thus did not get the expected results. Results like this highlight the case-sensitivity of the results. Consistent UX evaluation and measurement requires an understanding of what UX

actually is. Based on the literature review of this thesis and findings from other authors, this is still far from being settled. (e.g. Bevan, 2008; Väänänen-Vainio-Mattila et al., 2008b, p. 19.)

In order to understand the role of UX as an organizational factor in strategic management, proper validation techniques for UX should be discussed. Väänänen-Vaino-Mattila et al. (2008b, p.19) highlight the need to make UX assessable and manageable in order to proper consideration of UX throughout product development. Besides this finding, there have been discussions about adapting financial metrics related to the UX operations in order to map the optimal amount of resources needed. According to Hirsch et al. (2004), there is a need for unambiguous metrics as discussion tool between management and designers is seen in order to have information whether a particular design opportunity is worth the investment it requires. Further, to allow the management to understand the practical costs and benefits more clearly, these metrics should contain specific data and be directly tied to the other business operations, using financial metrics when possible (Hirsch et al., 2004; Schaffer, 2004, pp. 239-240).

As will be discussed, utilizing these tools accordingly in UX environment has been a challenge for the whole community. Earlier studies, including the one made by Good et al. (1986) argue that without measurable usability specifications, there is no way to determine the usability needs of a product and therefore we cannot have usability engineering (Gulliksen et al., 2008, p. 92). Since then, the design community itself has been looking more closely at exploring the return of investment (ROI) of user experience, aiming to measure the net benefits of a project against its total costs (Hirsch et al., 2004, pp. 8-9).

Literature seems to have colliding viewpoints on the usefulness to measure the costs and benefits of UX. Hirsch et al. (Hirsch et al., 2004, p. 14) argues that identifying metrics that link design interventions to business goals is the key factor in determining the value of a UX project, making it more believable to business units and senior managers. Sazonov (2011, p. 16) supports this by saying that there should be adequate means compare the UX features with metrics to screen the effectiveness of the development. Interestingly, Gulliksen et al. (2008, pp. 91-96) states that when measurements are available they have little or no influence on forthcoming decisions or any impact on future development.

The results implying the ROI of UX design activities are very few. There have been studies claiming that the cost benefit ratio of usability design to be 1:2 or even 1:10 in software development and that every dollar invested in ease of use returns $10 or $100 (Karat, 1997; IBM, 2012). However, these results are almost invariably expressed in such brief and approximate way that it any inconclusive results may be drawn from them. Besides the more generic studies, many single calculations on the monetary

benefit of usability actions are made but a more generic approach is still lacking. (e.g. Hirsch et al., 2004; Bias & Mayhew, 2005, pp. 25-28; Turner, 2011.) As argued by Nielsen and Levy (1994), this is more of a consequence of the nature of UX that usability as such cannot be measured but aspects of usability can.

Recent studies have indicated that traditional ROI approach to defining and measuring the value of usability does not show the true value of UX activities (Rosenberg, 2004, p. 23; Gulliksen et al., 2008). In essence, typical UX metrics for ROI are unusable (Turner, 2011, p. 53). It is seen to remain a flaw in UX research since in real world it is too hard to isolate the specific contribution of any product attribute, such as usability, to commercial success (Rosenberg, 2004, p. 27). To answer this challenge, literature has suggested using modified tools for means to assess the profitability of design decisions (e.g. Hirsch et al., 2004; Turner, 2011).

Being one of the first areas of UX research, usability was the first area to undergo discussions about profitability; designers were talking about the significance of usability in qualitative means and managers questioned the profitability of the usability operations that were raised in need for something concrete (Sazonov, 2011, p. 10). The main reason why it is difficult to enforce usability in the development process is that the benefits of usable product or system are often found quite abstracts. Moreover, the benefits are seen relative – various groups of people are involved in the process and each group has different perspective on evaluation of benefits and different priorities. This example resembles well the common challenge seen in UX literature that usability targets can seldom be among the measurable goals or sources for straight financial gain in system or product development products. (Škrabálek et al., 2011, p. 10.) One of the consequences of not having financial measures is that other project objectives might dominate and usability is considered only as a secondary objective of a project which results to a worse UX design. (e.g. Jokela, 2008, p. 56.) On the other end, Hirsch et al. (2004) and Turner (2011) had positive results with various case companies using UX to achieve a wide array of corporate goals by integrating UX goals in the organizational functions.

Colliding viewpoints on the ROI of user experience exist also in the industrial scope of industrial complex systems. Rosenberg (2004) claims that usability ROI calculations of UX are not representative in industries, where the total cost of the product can far exceed the cost to purchase the product, including such things as installation, training, and support costs. This additional cost does not show up in the producers' balance sheet, so a usability-driven reduction of the user's costs may not be much of a priority for the producer. As opposed to this, other opinions state that increased customer satisfaction results that these actions will create a positive impact and therefore be a crucial asset to the producer firm as well (Woodruff, 1997; Schaffer, 2004). Following the numerous

findings that support the shift to a more experience-based economy in both B2C and B2B industries (e.g. Pine & Gilmore, 1999; Venturi & Troost, 2004; Sward & Macarthur, 2007), it is justified to conclude that UX will have a positive impact to the producer firms of complex systems as well.

Important conclusions can be drawn from the findings above. Literature results imply that if UX can be linked to strategic goals and organizational functions properly, it will have a positive effect to the profitability of a company. In contrast, if UX is seen only as a secondary function, it will more likely have only minor benefit to the company. As resulted by Baraldi (2010), this effect can be applied to the context of complex systems as well, thus highlighting the role of involving strategic management to the product development and sales process.

Besides the HCI domain, the evolution of UX to a more holistic perspective is seen to make it closely relational to a separate, marketing-based definition called customer experience (CX) which compared to UX is a more business-oriented research area (Bogaards, 2012). Grounded by the business-oriented perspective of this thesis, it is relevant to make a brief overview of the recent development of these two terms.

2.1.3 The changing relationship between user experience and customer experience

The concept of customer experience has received increased attention from consultants, firm managers and academics alike. However, just like user experience, is not clearly understood. It has received increased It is often wrongly interpreted as a substitute of "customer relationships" or as a synonym for UX. (Palmer, 2010, p. 196.) A brief overview of the research area is made in order to understand the relationship and development of these two concepts.

When looking at the definition of CX many similarities to the nature of UX can be distinguished. Adopted from the definition from Meyer and Schwager (2007) and Gentile et al. (2007) CX is the reaction of the customer when being to any direct (e.g. when using the product) or indirect (e.g. non-related encounters with the company) contact with a product or a company. Likewise UX, customer experience emphasizes the situational as well as the temporal factors. Despite the common points, the two concepts should not be treated as synonyms (Bogaards, 2012). For example, focus on more holistic customer experience and customer behaviour, including pre- and after-sales activities seem to be given a bigger role in CX compared to the more product oriented UX theory (Verhoef et al., 2009, pp. 32-38).

One explanation for the different perspectives may arise from the different theory foundation between the two concepts. Compared to the HCI-basis of user experience,

customer experience has its roots in the field of marketing studies. As modeled by Christopher et al. (1991) and extended by Palmer (2010), the emergence of CX is argued to be the result of the evolution of competitive differentiation. During the 1950s and 1960s, firms in manufacturing dominated economies used tangible product qualities to gain competitive advantage. As the tangible product qualities reached a plateau from the 1970s, the focus for differentiator changed to services. In turn, services were found to become generic in the 1980s which shifted the focus towards the quality of ongoing relationships between the producer and customer. (Christopher et al., 1991.) According to Palmer (2010), in some industries relationships themselves have become too universal, all companies sharing similar patterns of relationship development activities. This lets experiential values become the differentiator for competitive advantage (Palmer, 2010, p. 197).

Even though there are many articles that prove the positive influence of service and relationship differentiation (for examples see Bundschuh & Dezvane, 2003; Ulaga & Eggert, 2006), the competitive advantage of experiential factors has been recognized in literature (e.g. Meyer & Schwager, 2007; Kotri, 2011). However, despite the recognition of the importance of customer experience by practitioners, the academic marketing literature investigating this topic has been limited and the publications are mainly found in practitioner-oriented journal or management books, making them mostly applicable to individual cases only (e.g. Berry et al., 2002; Shaw & Ivens, 2002). As discussed in the previous chapter, the same problem exists also in UX literature (e.g. Hellman & Rönkkö, 2008; Väänänen-Vainio-Mattila et al., 2008a). Findings like this resemble well the fuzzy and case-like nature of these two research areas.

Based on the findings, it can be argued that both CX and UX tend to be used to shift the focus in the company to a more customer- and user-oriented mindset (Bevan, 2009; Palmer, 2010). Small differences do exist, CX seen as concentrating on providing a holistic experience to the customer while traditional UX is focusing on improving the experience with the actual product. However, as discussed by Bogaards (2012) and Reichelt (2012), the evolution of both concepts has rocked their boundaries so that both terms share many viewpoints with the other. Both research areas have been proved to share many similar viewpoints also in the managerial aspects (Rosenbaum et al., 2000; e.g. Venturi et al., 2006; Meyer & Schwager, 2007; Kotri, 2011).

Resulting from this remark, the findings from CX literature may be compared to UX literature in order to draw a more comprehensive picture of the management aspects of UX oriented development projects. Likewise many other research fields in experiential literature, customer experience itself has many interesting findings on management behaviour. Due to the rather restricted focus on user experience management studies, any deeper investigation or conclusions to customer experience management will not be

done within this study. Further analysis on the impact of strategic decisions in user experience development projects will be made in chapter 2.3. As a preliminary step for this analysis, an overview on the nature of human-centered design process is discussed in the next chapter together with the success factors on project management aspects.

2.1.4 Industry context: Complex systems

As discussed in, for example, Miller et al. (1995), Davies (1996) and Hopday (1998), industrial complex systems (CoPS) have distinctive features that separate them from mass-produced goods. Miller et al. (1995) defined CoPS with three general characteristics:

> 1) They are made up of many interconnected, often customized elements (including control units, sub-systems and components), usually organized in a hierarchical way;
>
> 2) [Complex systems] exhibit non-linear and continuously emerging properties, whereby small changes in one part of the system can lead to large alterations in other parts of the system
>
> 3) There is a high degree of user involvement in the innovation process, through which the needs of the economic environment feed directly into the innovation process (rather than through the market as in the standard model).

Examples of CoPS include flight simulators, telecommunications exchanges, electrical power equipment, elevators, military systems, airplanes, helicopters, flexible manufacturing systems, chemical process plant, wind power systems, intelligent buildings and so on (Miller et al., 1995; Davies, 1996; Hobday, 1998).

The case firms in the Finnish metal and engineering industry can be described as archetypical suppliers of complex systems which can be expressed as CoPS. The first case firm, Fastems Oy Ab, is a significant player in the Finnish metal and engineering industry. It provides its customer companies with flexible manufacturing systems (FMS). They have been developing intelligent FMS control software, MMS5, which emphasizes usability as one of its main functions. This project is made within the implementation of this system. The second case firm, KONE Oyj, is one of the world's leading manufacturers of elevators, escalators and automatic doors. The group also offers equipment installation, updating, and maintenance services. This project discusses about implementing the People Flow concept in the company operations.

As defined by Miller (1995) and further discussed in Magnusson et al. (2005), the difference between mass-produced goods and CoPS has been generalized along several dimensions. These dimensions are product, manufacturing and market characteristics.

Product complexity is defined already early on to be made up of a large number of parts that interact in a non-simple way (Simon, 1962). Complex systems are typically high-cost engineering intensive systems (Inoue & Miyazaki, 2008, p. 1305). Compared with mass-manufactured products, in CoPS the number of components is higher and the relationships between components are more complex (Davies, 1996). High complexity is argued to lead to larger amount of potential architectures in the system (Magnusson et al., 2005, p. 4).

On market dimensions, a distinguishing feature of CoPS industries is the significance of bilateral oligopolies in market structure, with few suppliers and few buyers, argued to come from invariably intermediate goods industries (Miller et al., 1995; Davies, 1996; Hobday, 1998). Economics of capacity utilization predominate in most CoPS industries (Nightingale et al., 2003. Due to the nature of CoPS products, there is typically a close cooperation between the sellers and buyers in CoPS industries. Customers have typically a lot of impact on the direction of new product development projects and develop their own organizational capabilities in operating CoPS. (Magnusson et al., 2005, p. 5.) In addition, the effects of government policies are larger in CoPS than in mass-produced goods, since government often acts as customer as well and because CoPS markets are usually heavily regulated. (Magnusson et al., 2005, p. 5.) Furthermore, unlike the final consumer, intermediate customers are seen intimately involved in the innovation process throughout the life cycle of the project. (Inoue & Miyazaki, 2008, p. 1305.)

On manufacturing dimensions, CoPS industries are typically found to be firms with high unit costs, low volumes and high degrees of customization (Acha et al., 2004). According to Davies (1997) and Inoue and Miyazaki (2008) CoPS is manufactured primarily on a project basis as one-offs or small batches for professional business. They often include many subcomponents and subsystems and involve high capital-intensity, engineering intensity and customer adaptation. Installation and delivery takes typically a significant amount of time and the projects are often carried out through several project phases. (Henderson, 1994; Magnusson et al., 2005)

During the recent years, software has become a vital part also in traditional industries. There is a growing need of tools to handle an increasingly complex business due to strong pressure for product customization, increased product variants, shortened lead-times and increased efficiency. (Baraldi, 2010, p. 19.) Nightingale et al. (2003) show that software control systems in CoPS enable improved capacity utilization and systems performance. Software development has faced challenges of complexity to an extent that conventional product development has not. (Young & Faulk, 2010; Botzenhardt et al., 2011.) One approach to increase the user-centeredness of software systems is called

Agile design (for examples see Schatz & Abdelshafi, 2005; Chow & Cao, 2008). This design approach will be further discussed in the following chapters.

Project management of complex system is defined as open, dynamic, recursive, non-linear, and emergent, including many stakeholders and wider organizational factors (Dombkins, 2006). However, as argued by Whitty and Maylor (2009), sharing these kinds of characteristics, involving unforeseen events that occur during a project are inevitable to some degree in almost all development projects. The authors conclude by saying that a new way of managing the development projects of complex systems compared to traditional development projects is not needed (Whitty & Maylor, 2009). Following this conclusion, it is interesting to see how implications made on managerial behaviour in non-complex user-centric design development projects can be reflected to the industrial scope of this research.

The role of users has not been central in the CoPS literature (for exceptions see e.g. Flowers, 2004; Hobday et al., 2005; Baraldi, 2010; Hecker & Berger, 2011). Earlier literature, including Miller et al. (1995, p. 365), argue that users involve themselves intimately in the innovation process of complex systems since they depend on CoPs's for their survival, growth and profitability. This has been proven work properly in some industries, for example in the case made by Hopday et al. (2005, p. 1122) on military equipment. However, as resulted by Baraldi (2010), the user requirements for a system are rarely clear or even properly defined. User perceptions and the context of use in CoPS are important factors because they account for additional complexity on their own. The level of perceived complexity by specific users has been found to vary between different users, making the use of the system even more challenging for some people. (Baraldi, 2010, pp. 20-37.)

User-related issues is argued to explain why some CoPS projects fail, run overtime or leave users with poorly understood solutions, irrespective of the degree of customization. A more user perspective approach is seen to highlight new facets that could enhance the understanding of CoPS. (Baraldi, 2010, p. 37.) The influence of management of user experience in CoPS is discussed further in the next chapters.

2.2 Decision making in system development and sales process

2.2.1 Success factors on project management

The analysis on the management aspects of UX oriented system development projects will be approached by first observing the critical success factors found in project management literature. This will give a good reference point of the aspects of management and strategic decisions which are found to be critical in development

projects in general. The literature findings will be compared with the more UX oriented literature results as well as with the empirical analysis made within this thesis. This comparison will lead to a better understanding of what similarities and differences could exist between project management in general and in the context of complex systems in UX oriented development projects.

Project management is defined as the process of controlling the achievement of the project objectives (Munns & Bjeirmi, 1996, p. 81). Project and product development managers are stated to have the responsibility to define the product strategy and roadmap, break it down into work requirements, help the development teams to understand and transform the requirements into work packages, plan the execution of the go-to-market and ensure proper product support (Munns & Bjeirmi, 1996; van de Weerd et al., 2006). In addition, Cook-Davies (2002, p. 187) emphasizes the need of project manager to cooperate with both senior management and the line managers in for example R&D and marketing departments in delivering corporate-wide project success.

Since the practical experience showed a large number of failed projects and programs, several publications have been focusing on identifying the critical success factors (CSFs) of project management and development projects (e.g. Gemuenden & Lechler, 1997; Cooke-Davies, 2002; Fortune & White, 2005). As defined by Bullen and Rockhart (1981), CSFs are the limited number of areas in which satisfactory results will ensure successful competitive performance for the individual, department, or organization. They are the key areas where things must go right for the business to flourish and for the managers' goals to be attained (Bullen & Rockart, 1981, p. 385). When implemented successfully, they are stated to lead to development projects that can improve time to market, and can enhance competitive position, product sales or product margins (Cooke-Davies, 2002, p. 189).

Fortune and White (2005) have identified the CSFs based on a review of 63 publications in project management literature which encompasses theoretical studies and empirical studies of successful and unsuccessful projects (Table 2). Based on the review, the three most cited CSFs are: the importance of a project receiving support from senior management; having clear and realistic objectives; and producing an efficient plan. As discussed by Fortune and White (2005), there is, however, only a limited agreement among authors on the success factors. Although 81% of the reviewed publications include at least one of these three factors, only 17% cited all three (Fortune & White, 2005, p. 54). Wateridge (1995) identifies the same lack of concurrence among researchers on the factors that influence project success. Furthermore, Cooke-Davies (2002, p. 186) resulted in his review of 136 studies that there is a strong correlation between management practices and project planning and performance efficiency. Similar correlation between different CSFs was recognized also in the study of Chow

and Cao (2008). Based on these findings it seems that even though many CSFs support the performance of each other, many authors do not identify them as being relational components of a coherent unity.

Table 2. Critical success factors on project management (modified from Fortune & White (2005, pp. 55-56))

Project attribute	Critical success factors from literature	Count of citations
Goals and obj.	Clear realistic objectives	31
	Strong business case/sound basis for project	16
Performance monit.	Effective monitoring/control	12
	Planned close down/review/acceptance of failure	9
Decisions maker(s)	Support from senior management	39
	Competent project manager	19
	Strong/detailed plan kept up to date	29
	Realistic schedule	14
	Good leadership	15
	Correct choice/past experience of project management tools	6
Transformations	Skilled/suitably qualified/sufficient staff/team	20
Communication	Good communication/feedback	27
Environment	Political stability	6
	Environmental influences	6
	Past experience (learning from)	5
	Organizational adaptation/culture/structure	10
Boundaries	Project size/complexity/number of people involved/duration	4
Resources	Adequate budget	11
	Sufficient/well allocated resources	16
	Training provision	7
	Proven/familiar technology	14
	Good performance by suppliers/contractors/consultants	10
Continuity	Risks addressed/assessed/managed	13
Others	User/client involvement	24
	Different viewpoints (appreciating)	3
	Project sponsor/champion	12
	Effective change management	19

The authors use different categories to compose a model called the Formal System Model (FSM) to help overcoming the criticism that has been pointed towards CSF literature. Originally meant to illustrate project failure methods by Bignell and Fortune (1988), this acts as a framing device for project critical success factors and

distinguishing between successful and unsuccessful projects. Using the Formal System Model was found to include the inter-relationships of the individual factors which often are seen absent in CSF literature (Nandhakumar, 1996) will be taken into account by using the model. In addition, the system enables a better approach on the dynamic process by showing nine different dimensions instead of individual aspects which are seen to provide too narrow a view of the development process (Larsen & Myers, 1999). Implicating from the results, the CSFs were mapped into nine different categories, which each have a distinct role in carrying out the project. Additionally, four CSFs were identified that couldn't be categorized in these nine dimensions. These are categorized under "Others" dimension.

A product development project can be understood as an example of a FSM. Regarding the structure of the system, the formal system at the heart of the model comprises a decision-making subsystem, a performance monitoring subsystem and a set of subsystems and elements which carry out the tasks of the system and thus effect its transformations by converting inputs into outputs. Decision-making subsystem manages the system and is responsible for decisions about how the purposes of the system are to be achieved. This converts to the strategic decisions made by senior and project managers. The formal system is influence by the wider system and the environment. (Fortune & White, 2005, pp. 54-57.) An example of the FMS is shown in Figure 2.

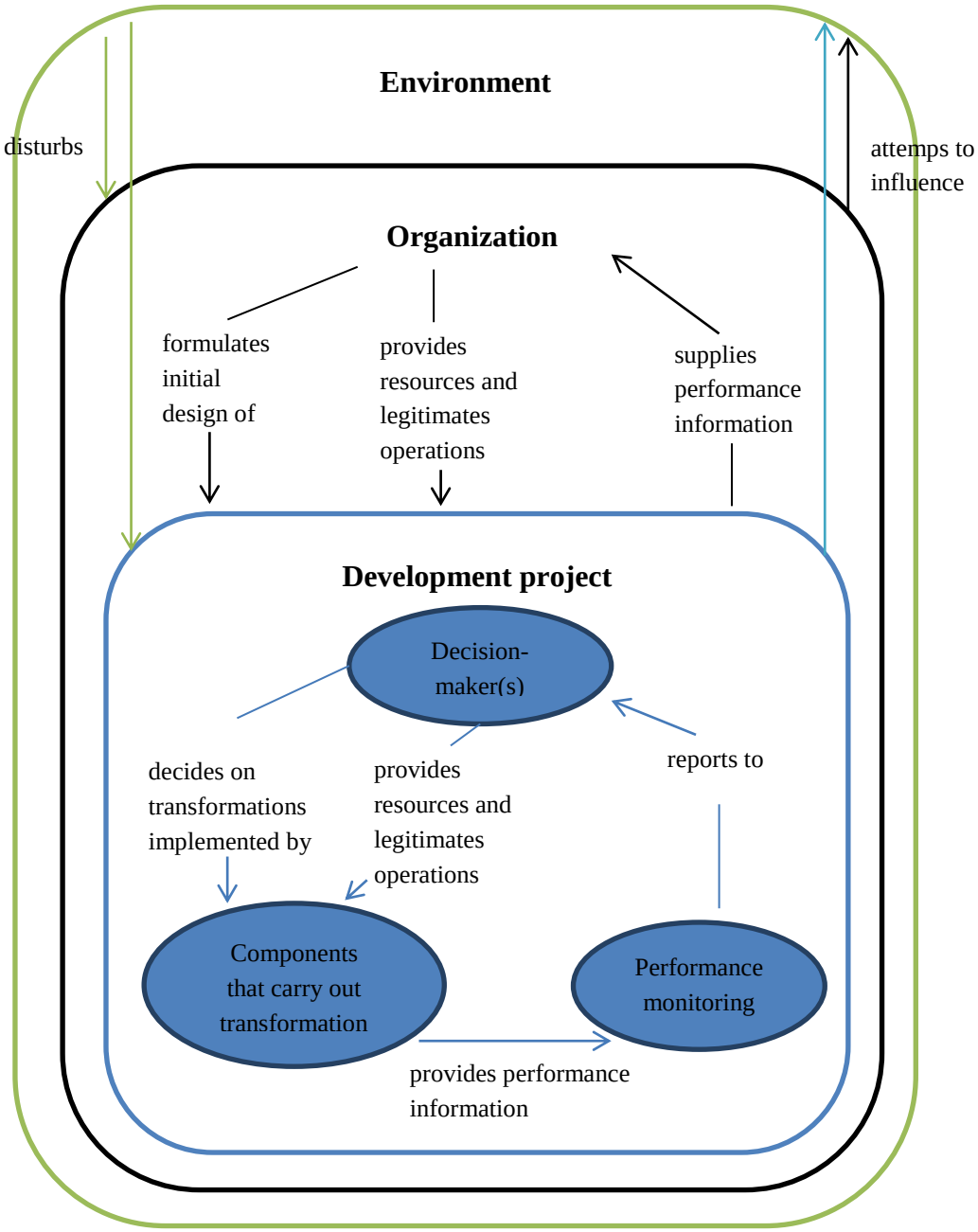

Figure 2. An exemplary project drawn in the Formal System Model (modified from Fortune & White, 2005)

The CSFs reviewed above reflect well with the definition of the responsibilities of the project managers described earlier in this chapter. Both put a big emphasis on the importance of monitoring and organizing tasks as well as ensuring that execution team is working properly. Close relations to senior management, company functions and clients is also seen important. (Cooke-Davies, 2002.)

In order to make the project both realistic and valuable, the management is argued to ensure that the project has clear goals made on a relevant business need. Planned

monitoring system and review sessions will help the managers to track the performance in real time, keep the scope adequate and learn from made mistakes. The project manager, who often acts as the main decision maker during the project, should be enough competent and a good leader to be able to control such project. He or she should ensure proper support from senior management to the project, make sure that the project staff is qualified enough and keep good communication flow with the senior management, the operation line managers and the clients. (Fortune & White, 2005, pp. 54-57.)

Properly defined project will help in giving adequate and well allocated resources to the project. Involving parties (suppliers/contractors/consultants) with good expertise to the project and utilizing technology that is familiar to the project team and the client is likely to increase project performance. By giving additional emphasis on training and risk management before, during and after the project will minimize the risk for project termination and most likely lead to a more efficient implementation process. (Fortune & White, 2005, pp. 54-57.)

Regarding management behaviour, there are different findings on the correct way of coordinating product development. Ward et al. (2009) emphasize the need for empowerment instead of control, the need for effectiveness and value creation instead of efficiency and cost-cutting and the need for possibility and experimentation instead of risk avoidance. As opposed to this, Ludwick and Doucette (2009) rely on more traditional methods, including project management, strong leadership and implementation of standardized terminologies. Botzenhardt et al. (2011) highlight the role of managers as the communication enables between designers and developers. In addition, cooperation between product managers and product designers was rated to have a positive influence to product release success (Botzenhardt et al., 2011, pp. 9-14.). However, Cuijpers et al. (2011) remind that inter-departmental collaboration is likely to stress the patience of the managers and may result in unwanted project delays and project terminations. The authors add that this should not prevent firms from innovating across departmental boundaries given its potential benefits (Cuijpers et al., 2011, p. 573).

The varying viewpoints described above on managing product development highlight the case-dependency of each development project. This implies a need to adapt management behaviour according to the requirements and nature of each development project.

The aspects above give some understanding to the critical success factors in project management literature. The findings will be used as a reference point to the theoretical and empirical findings on the success factors in user experience oriented projects in the context of complex systems. The theoretical foundation for the UX oriented project

management will be made in chapter 2.3. The empirical investigation will be presented in chapters 3 and 4. Before the success factors in UX environment can be presented, the nature of UCD and Human-centered Design Process should be introduced.

2.2.2 User-centered design process

The development from efficiency usability to emphasizing broader holistic context of human behaviour in HCI started also redefinition of user-centered design (UCD) and human-centered design (HCD). Following the findings of Vieritz et al. (2011), the integration of UCD in the non-functional development projects, including UX, also in complex industrial systems is strongly recommended. A brief overview of these two concepts will give us valuable insight in order to further discuss the more focused managerial aspects.

In UCD and HCD, the humans are taken into consideration as soon as possible during the design processes and kept as evaluators of the development throughout the process. The difference is that human-centered design has a standardized ISO definition, whereas user-centered design is a broader definition. (Sazonov, 2011, p. 8.)

ISO (2010) defines human-centered design as an "approach to system design and development that aims to make interactive systems more usable by focusing on the use of the system and applying human factors/ergonomics and usability knowledge and techniques" (Figure 3). The standard emphasizes to use term human-centered design rather than user-centered design because as opposed to UCD processes, HCD addressed impacts on a number of stakeholders, not just those typically considered as users. (ISO, 2010.) This is seen important especially in the design of industrial systems, where the end users have little impact to the buying criteria of the product and the decision is made by other parties (McCoy, 2002). Despite the fact, literature often uses them for similar purposes to include human-centered activities throughout a development life-cycle (Siricharoen, 2010, p. 73). Thus, UCD will be used as the terminology to indicate human-centered activities in the following chapters.

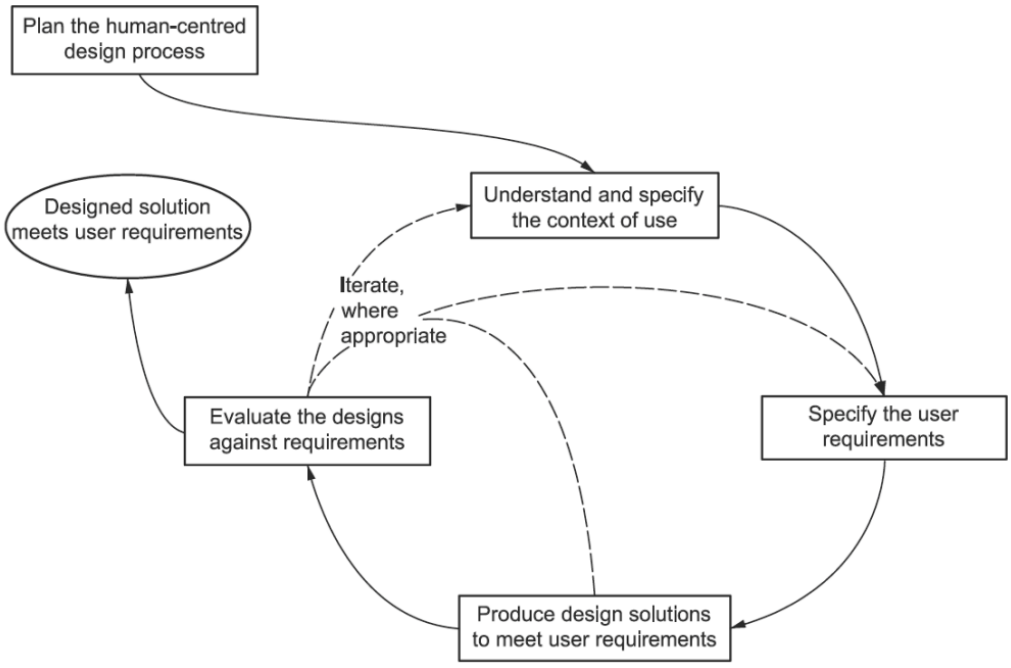

Figure 3. Interdependence of human-centered design activities (modified from ISO, 2010)

According to Sazonov (2011, p. 16) a better understanding of the product's UX aspects will help the firm to better formulate and communicate the strategic goals for the product. In every part of the human-centered design activities, the active involvement of users and other stakeholders is seen critical for a clear understanding of user and task requirements, iterative design and evaluations, and a multi-disciplinary approach (Vredenburg et al., 2002).

There are many internal and external obstacles to integrate human-centered approaches in systems development. Rosenbaum et al (2000) identified several major obstacles to creating a strategic impact with usability. These included resource constraints, internal attitudes and resistance to user experience design, lack of understanding and lack of trained usability experts (Rosenbaum et al., 2000). Clegg et al. (1997, p. 860) recognize that IT development projects are typically technology-led and existing project management neglect human and organizational issues, thus helping to maintain a technical focus, preventing a deeper insight on the users' real needs. On external issues, both Clegg et al. (1997) and McCoy (2002) argue that end user have rarely any choice but to use what is installed on their computers and therefore do not have any influence in the design or buying decision of new systems. Nevertheless, UCD is seen to be worth all the investments that it requires, proved by experiences on compelling returns by customer satisfaction and accolades from trade press (Sobiesiak et al., 2002, p. 302).

In many of these cases where the focus is solely on improving the product usability functions, the concept can be easily perceived as just a tool of the design department

(Venturi et al., 2006). Understanding this challenge Rohrer and Design (2009) implicate that all user experience development should come from the strategic and business decisions. To be able to make a greater impact to the organization, there is a need to involve a person with sufficient decision-power in the development process, thus creating the possibility to include UX as one of the key competences of a company. (Sazonov, 2011; Škrabálek et al., 2011.) As the business opportunity is understood, the product that is required to achieve the business goals is designed in human centric ways (Rohrer & Design, 2009). In a sense, the UX optimization is a guide for creating viable and sustainable business, not just a product design aspect. (e.g. Boivie et al., 2006; Chamberlain et al., 2006; Sazonov, 2011.)

Most authors agree that the most critical part is to integrate UX goals with other strategic goals of the company. (Venturi & Troost, 2004; Boivie et al., 2006; Chamberlain et al., 2006; Venturi et al., 2006; Sward & Macarthur, 2007; Lockwood, 2009; Love et al., 2009; Sazonov, 2011). Success will come from a systematic managed, user-centric approach throughout the organization (Sward & Macarthur, 2007, p. 35). This will define the actions and operations this organization must undergo in order to achieve the creation of the target experiences (Sazonov, 2011, p. 39).

Clear findings on management behaviour in product development processes seem to be missing in the earlier literature. Schmidt and Calantone (2002, p. 105) explain this by arguing that we have limited knowledge of how managers use information, evaluate projects, and make critical termination decisions since researchers typically examine projects that made it to market. At the same time it is rated as a critical and one of the weakest aspects of product development processes. (Cooper & Kleinschmidt, 1995).

Recent publications have answered this challenge by studying the role of product managers in development projects (e.g. Venturi et al., 2006; Sward & Macarthur, 2007; Kittlaus & Clough, 2009; Sazonov, 2011). The results imply that product managers have the responsibility to define the product strategy and a roadmap, break it down into product development releases with associated business requirements, help the development teams to understand and transform the requirements into work packages, manage the go-to-market and ensure proper product support (van de Weerd et al., 2006; Kittlaus & Clough, 2009). As a result, the involvement of managers is seen not only in the part of strategic decisions, but in every part of product development process (Venturi et al., 2006).

Regarding the effort of managers in UCD and HCD process, Venturi et al. (2006) interviewed 83 UCD practitioners and found out that management usually understand that usability and UX should be part of the business strategy and takes actions to maintain and improve user-centered design skills, resources, and technology and usability awareness in the organization. However, the management does not seem to set

usability goals or provide incentives for reaching good usability. (Venturi et al., 2006, p. 221.) To improve the current situation, the authors recommended the management to ensure that UX is part of business strategy by setting usability goals for performance and satisfaction and providing incentives that should be awarded whenever usability goals are reached or exceeded. These goals should be explicitly discussed with the customer. (Venturi et al., 2006, p. 231.) Besides being the thriving and authorizing role in the development, the role of managers is argued to involve a motivational aspect, trying to discover and promote beliefs and values within the organizational culture (Škrabálek et al., 2011, p. 3).

However, even though the executive person is present in product development, he or she is not typically involved in the design process but obtain merely a role of a reviewer or a coordinator. For example, it is stated that executives should never specify a design feature but reinforce the culture for human-centered design instead. It is better to have a good manager without much usability experience than a usability expert who does not understand management. (Schaffer, 2004, pp. 25 & 179.)

On the implementation of HCD or UCD, Lockwood (2009) uses design strategy as a basis for creating the design principles, suitable organizational structures and sources of design resources. Thereafter, he emphasizes on the inter-departmental collaboration and communication in creating the design minded organizational culture. The focus on collaboration and pooling of various organizational stakeholders - more specifically the cooperation between sales, R&D and marketing teams - for a single organizational vision in the product design process is seen valuable also in other studies (Kotha et al., 2004; Sward & Macarthur, 2007; Love et al., 2009; Ernst et al., 2010). It has been found to increase the visibility of the UX teams, raising potential issues much earlier in the design process (Budwig et al., 2009, p. 3083). Besides communication and cooperation, Ventury and Troost (2004, p. 450) state that successful UCD integration is constructed by good team skills and experience, manager commitment and adequate infrastructure (incentives, resources, cyclic improvement). The importance of infrastructure and resources has been found critical also in other studies (Boivie et al., 2006; Love et al., 2009; Botzenhardt et al., 2011).

As stated by Boivie et al. (2006), the incorporation requires a great deal more than simply adding a few activities to existing processes. This includes new methodologies, new ways of planning and allocating resources, a shift of focus and attitudes among all stakeholders, to name a few. Thus, a user-centered approach requires more than just a new development process - it is to some extent an entirely new development paradigm. (Boivie et al., 2006, p. 603.)

According to the findings, management commitment, adequate infrastructure and inter-departmental collaboration seem to be the three biggest contributors to UCD integration

in product and system development processes. Management commitment is the thriving force that enables sufficient infrastructure for inter-departmental collaboration that is needed for a holistic, human-centric approach in product design. Communication and collaboration themselves may enable information exchange but not necessarily information use. Even if information is exchanged, it may not affect actions and decisions in the development of a product release if there is no person with decision-making power involved. (Iivari, 2004; Perks et al., 2005.) To continue this discussion, the following chapter will focus on distinguishing the similarities and differences between traditional and UX oriented development projects. This comparison will lead to implications for company management in UX environment.

2.3 Success factors in UX related project management

Recent literature on product development, innovation performance in user experience development made on physical products and systems as well as software projects has identified several success factors linked to project and company management. These factors distinguish some aspects of the organization that have been found to create both short and long term positive results to the strategic impact of UX oriented development projects. Derived from the findings from several case studies (e.g. Sobiesiak et al., 2002; Venturi et al., 2006; Hecker & Berger, 2011; Jain et al., 2011), UX oriented development relates to user- and customer oriented development projects, where user experience is one of the key factors to create competitive advantage of the product or software system being developed.

Due to the limited amount of researches of UX studies in complex systems, some of the findings are taken from other topics, more specifically from customer experience management and Agile software development literature. Despite the noted differences in the focus of CX and UX theories, there have been various studies proving their sharing viewpoints in both project-oriented and management aspects. (Rosenbaum et al., 2000; e.g. Venturi et al., 2006; Meyer & Schwager, 2007; Kotri, 2011). Utilizing the findings of CX management literature will answer to the need to unite the research areas expressed in recent discussions (Bogaards, 2012; P. Reichelt, 2012).

Agile methods have their foundation in software engineering. However, recent evolution of Agile software development methods have been towards providing a more holistic user experience with the software, indicating a closer relationship towards the concept of UX. Development towards intricate user interfaces or for which usability is a major factor in product success has led to a demand of a more sophisticated, model-driven approach to user interface design. This is where UCD is seen to enter the picture. (Constantine, 2002, p. 5.) Already earlier studies have indicated the similarity of user-centered design to the traditional software development methods (e.g. Jeffries et al.,

2001). According to Constantine (2002, p. 6), UCD can be qualified as an Agile process.

Literature has identified a need for flexibility to address UX concerns in Agile projects (e.g. Detweiler, 2007, p. 40; Kollmann et al., 2009, p. 11). As stated by Felker (2012, p. 301), this materializes in the need to adapt to the different design tools of both methods. Despite this fact several case studies and reported experiences by practitioners have reported positive experiences of how UCD and Agile can work together (Williams & Ferguson, 2007; Ambler, 2008; Sy & Miller, 2008; Kollmann et al., 2009; Rosenberg & Kumar, 2011; Felker et al., 2012). Furthermore, the many recent discussions and case studies that aim to bridge the gap between Agile software development and projects with user centered methods (for examples see Sy & Miller, 2008; Bendt, 2011; Ferreira, 2012) seem to shift trend to even closer collaboration.

Instead of focusing strictly to the limited amount of UX-based literature results, an approach which encompasses the central findings from the fields of UX, CX, UCD and Agile will provide a more comprehensive picture of the CSFs in the UX oriented development projects.

The review was conducted with the following search engines:

- ISI Web of Knowledge
- Google Scholar

In order to find the research-related publications, the following key words were used: “UX management”; “UX project management”; “UX success factor”; “UX Agile”; “User experience management”; “User experience complex systems”; “User experience project”; “User experience project management”; “UCD management”; “Customer Experience Management”. When executing the search in ISI Web of Knowledge in June-August 2012, the number of results ranged between 3 and around 4090 hits. From these results, the topics and abstracts of the papers were looked with more detail in order to find the most suitable data. A similar search method was conducted with Google Scholar. However, these search terms resulted many times up to several million results, making it impractical to scroll through all of the publications. Furthermore, the publications that showed up after the first five pages of results were typically no longer related to the original search topic. Thus, a deeper insight of the seemingly appropriate literature was narrowed to the first 100 results. In addition to the search engine review, the reference list of the articles found with these search terms was examined for further articles, books and case-results related to the scope of this research. These methods were found sufficient during the literature reviewing process to form an adequate understanding of the existing academic literature related to the research topic.

As a result of the review, a total of 15 relevant publications were found. Although the search methods were considered sufficient enough during the study, the amount of suitable articles can be considered relatively low. This reflects well the absence of this research topic within academic literature and calls for a further focus in this area. Furthermore, it questions the validity of making any conclusions from the drawn research material. However, all of these publications included several success factors in UX oriented development projects, ending up in rather rich reference material. All together 130 separate success factors were identified in the publications.

All of these papers were academic publications published by universities or/and companies. The amount of resulted CSFs in these publications ranged from 3 to 16, eight being the median of expressed factors. The implied results from these publications were mostly based on case studies and empirical observations on UX related development projects. Although the number of found publications is substantially lower (15 versus 63 publications) compared to the review made by Fortune and White (2005) on project management CSFs, the more narrowed scope and rich material of the publications should lead to more credible results and make it possible to compare the review results to a certain extent.

Table 3 shows the results mapped onto components or project attributes of the Formal System Model similarly to the study of Fortune and White (2005, p. 57) on project management CSFs. The left column describes the project attribute; the middle column contains the resulted CFS; the right column expresses the names of the cited authors for each CSF.

Table 3. Success factors on UX oriented development projects

Project attribute	Critical success factors from literature	Author
Goals and objectives	Strong business case/sound basis for project	Rosenbaum et al. (2000); Venturi et al. (2006); Jain et al. (2011)
	Target-group oriented strategy	Jain et al. (2011); Kotri (2011)
	Clear realistic objectives	Hirsch et al. (2004); Jain et al. (2011)
	Providing usability goals and providing incentives	Venturi et al. (2006)
Performance monitoring	Validation of customer behaviour/feedback/requirements	Hirsch et al. (2004); Frow & Payne (2007); Meyer & Schwager (2007); Hecker & Berger (2011); Jain et al. (2011); Kotri (2011); Rosenberg & Kumar (2011)
	Effective monitoring/control	Detweiler (2007); Meyer & Schwager (2007); Chow & Cao (2008); Hellman & Rönkkö (2008); Kotri (2011)
	Competitive analysis/review sessions	Venturi et al. (2006); Detweiler (2007); Hecker & Berger (2011); Jain et al. (2011); Rosenberg & Kumar (2011)

	Adequate UX measurement tools	Rosenbaum (2000); Vredenburg et al. (2002); Jain et al. (2011)
Decisions-maker(s)	Executive/founder/management support	Rosenbaum et al. (2000); Sobiesak et al. (2002); Schatz & Abdelshafi (2005); Venturi et al. (2006); Detweiler (2007); Meyer & Schwager (2007); Chow & Cao (2008); Hecker & Berger (2011); Jain et al. (2011); Kotri (2011)
	Good leadership	Schatz & Abdelshafi (2005); Frow & Payne (2007); Hecker & Berger (2011); Jain et al. (2011); Kotri (2011)
	Competent project manager	Chow & Cao (2008); Jain et al. (2011); Rosenberg & Kumar (2011)
	Authority to UX expertise	Vredenburg et al. (2002); Hellman & Rönkkö (2008); Rosenberg & Kumar (2011)
Transformations	Cross-functional research/design approach	Rosenbaum et al. (2000); Sobiesak et al. (2002); Vredenburg et al. (2002); Frow & Payne (2007); Jain et al. (2011); Kotri (2011)
	Skilled/motivated staff/team	Schatz & Abdelshafi (2005); Chow & Cao (2008); Hecker & Berger (2011)
	Focus on supporting user tasks	Sobiesak et al. (2002); Hecker & Berger (2011)
Communication	Internal/external communication of design methods	Venturi et al. (2006); Detweiler (2007); Frow & Payne (2007); Meyer & Schwager (2007); Jain et al. (2011); Kotri (2011); Rosenberg & Kumar (2011)
	Close customer relationship	Venturi et al. (2006); Chow & Cao (2008); Hecker & Berger (2011); Jain et al. (2011); Kotri (2011); Rosenberg & Kumar (2011)
	Good communication	Meyer & Schwager (2007); Chow & Cao (2008); Jain et al. (2011); Rosenberg & Kumar (2011)
Environment	Past experience (learning from)	Hirsch et al. (2004); Schatz & Abdelshafi (2005); Detweiler (2007); Hecker & Berger (2011); Jain et al. (2011); Kotri (2011)
	UX oriented culture/mentality	Sobiesak et al. (2002); Hellman & Rönkkö (2008); Hecker & Berger (2011)
	Organizational adaptation for UCD	Sobiesak et al. (2002); Rosenberg & Kumar (2011)
Boundaries	Proj. size/complexity/no. of people involved/duration	Chow & Cao (2008)
Resources	Sufficient/well allocated resources	Rosenbaum et al. (2000); Sobiesak et al. (2002); Detweiler (2007); Hecker & Berger (2011); Jain et al. (2011); Rosenbaum & Kumar (2011)

	Systematic/appropriate training and meetings	Hirsch et al. (2004); Meyer & Schwager (2007); Chow & Cao (2008); Hecker & Berger (2011); Kotri (2011)
	Strong communication infrastructure	Sobiesak et al. (2002); Detweiler (2007); Jain et al. (2011); Hecker & Berger (2011); Rosenberg & Kumar (2011)
Continuity	UX guarding functionality in product development	Hellman & Rönkkö (2008)
Other factors	Customer involvement in development process	Frow & Payne (2007); Chow & Cao (2008); Hecker & Berger (2011); Jain et al. (2011); Kotri (2011)
	Selective recruiting of employees	Kotri (2011)

The found factors were found to include a lot of case-dependency. Although 80% of the publications included on of the three most cited factors (Validation of customer behaviour/feedback/requirements, Executive/founder/management support and Internal/external communication of design methods), only 20% of the publications included all three factors. Similar notes were made in the review of the project management success factors (Fortune & White, 2005). This shows well the scattered nature of success factors literature.

Some valuable implications can be drawn from the review. The results from each dimension, including the percentual amount of studies that have cited the specific CSF from the reviewed publications will be compared to the results on project management CSFs drawn by Fortune and White (2005, pp. 54-57). Due to the limited amount of UX related CSF literature, the citation count of relevant publications is substantially lower compared to project management in general. Using a percentual amount of cite references will give the most comparative and valid results between project management and UX related literature. In order to improve the reliability of the results, the findings will be reflected to the results on some of the relevant theoretical and case-based publications of UX and CoPS literature.

The results for the critical success factors from each dimension will be compared to the CSFs made by Fortune and White (2005) on project management literature. The figures expressed within each dimension of the Formal System Model show the percentual comparison of the reviewed CSFs between project management literature and UX related literature findings. The left column shows the listed CSF whereas the percentual amounts on the middle and right column show the proportion of all publications that have mentioned the specific success factor. The possible discrepancies using only percentual evaluation were already expressed in the review of Fortune and White (2005) and Wateridge (1995). As demonstrated by Fortune and White (2005), dividing the

success factor to the dimensions of the FSM provides a more reliable way to analyze the importance of each CSF.

The text in the middle on each table describes the according CSF. The percentage shown in the right side is the percentual amount of reviewed publications that have cited the specific attribute. To widen the analysis beyond just the percentual amount of cited publications the following comparison will include mentions if the relative criticalness of the attribute in reference literature does not correlate with the proportion of studies that have mentioned the specific CSF.

Goals and objectives

Table 4. Comparative CSFs regarding the goals and objectives of a project

	Project management literature (n=63)	UX related literature (n=15)
Clear realistic objectives	49 %	13 %
Strong business case/sound basis for project	25 %	20 %
Target-group oriented strategy	0 %	13 %
Providing usability goals and providing incentives	0 %	7 %

Goals and objectives reflect to the continuous purpose or mission of the development project or process that gives rise to expectations (Fortune & White, 2005, p. 56). The findings derived from the UX related literature resemble the findings of Fortune and White's (2005) on project management to some extent. The importance of having a high profile or sound basis on the project is emphasized similarly on both results. Project management literature seems to emphasize substantially more the clear project objectives whereas UX related literature focuses more on the correct strategy, development methods and incentives. One explanation to this difference could be that instead focusing on solely on separate projects, UX related development processes often extends beyond traditional timeframes to more continuous improvement and development processes (for examples see Vredenburg et al., 2002; Venturi & Troost, 2004; Venturi et al., 2006).

Having well defined goals and project selection criteria is seen to lead to higher credibility and a better customer-approach in UX context (Rosenbaum et al., 2000; Kotri, 2011). These goals are tied to both pragmatic, functional goals as well as more hedonic personal goals (Väänänen-Vainio-Mattila et al., 2008a, p. 3962). This provided with giving incentive-based goals will according to Venturi et al. (2006) lead to a successful adoption of UCD processes in the development project.

Performance monitoring

Table 5. Comparative CSFs regarding the performance monitoring of a project

	Project management literature (n=63)	UX related literature (n=15)
Effective monitoring/control	19 %	33 %
Planned close down / review / acceptance of failure	14 %	0 %
Validation of customer behaviour / feedback / requirements	0 %	47 %
Competitive analysis/review sessions	0 %	33 %
Adequate UX measurement tools	0 %	20 %

The performance monitoring subsystem is charged with observing the transformation processes and reporting deviations from the expectations to the decision-making subsystems so that it can initiate corrective action where necessary (Fortune & White, 2005, p. 56). As can be seen from the cite percentage comparison, UX related literature seem to highlight more the importance of performance monitoring with over a triple amount of citing frequency over project management literature. Besides focusing on monitoring and controlling the development process, the focus is on validating customer behaviour, feedback or requirements, competitive analysis and review sessions and creating adequate UX measurement tools. The absence of planned close down might arise from the nature of UX oriented development being less time- and project-specific, continuous processes.

Regarding the positive effects of the stated CSFs, monitoring UX requirements throughout the development cycle is said to lead to a more efficient product development cycle (Hellman & Rönkkö, 2008). It is also seen to help giving a better insight to the perceived value of the project or attribute and lead to a better quality end product. (Chow & Cao, 2008; Kotri, 2011). Measuring and validating customer behaviour and feedback is found to enable consistent value assessment of the UX goals of the product (Hirsch et al., 2004; Kotri, 2011; Rosenberg & Kumar, 2011). According to Baraldi (2010) understanding user requirements is especially important in CoPS environment where the multiple dimensions of complexity give extra challenges to the system users.

The generally accepted positive influence of utilizing reliable metrics in development project management (for examples see Ling et al., 2009; Wysocki, 2011) remains

unsettled in the more dynamic UX environment. Others (e.g. Hellman & Rönkkö, 2008; Škrabálek et al., 2011) emphasize its importance in order for decision-makers to evaluate investments systematically. Others (e.g. Gulliksen et al., 2008) claim that using such tools will not create such positive effect to the organization and recommend applying a user-centered contextual analysis instead. Concluding from these findings, it can be argued that the value of using metrics is likely dependent on the nature of each case or development project.

Decision-maker(s)

Table 6. Comparative CSFs regarding the decision-maker(s) of a project

	Project management literature (n=63)	UX related literature (n=15)
Support from senior management	62 %	67 %
Suitable project management skills / process	30 %	20 %
Good leadership	24 %	33 %
Strong/detailed plan kept up to date	46 %	0 %
Realistic schedule	22 %	0 %
Correct choice/past experience of proj. manag. tools	10 %	0 %
Authority to UX expertise	0 %	20 %

The decision-making subsystem is seen as one of the most important pieces of the model, carrying the responsibility for decisions about how the purposes of the system are to be achieved such as which transformations are to be carried out and by what means and for providing the resources to enable this to happen (Fortune & White, 2005, pp. 54-55). Executive management or founder support was the most cited CSF within all dimensions in both project management literature (62% of publications) and UX related literature (67% of publications). Its importance was seen very critical in usability and UCD based studies (Rosenbaum et al., 2000, p. 343; Venturi et al., 2006, p. 229; Jokela, 2008, p. 58) It is seen to have an effect to the credibility, visibility and cost-effectiveness of the development project and help achieving the targeted employee behaviour (Rosenbaum et al., 2000; Schatz & Abdelshafi, 2005; Kotri, 2011). This further leads to a bigger impact of the user-centric aspects to the development project or the organization (Venturi & Troost, 2004; Detweiler, 2007; Chow & Cao, 2008). On the other hand, lack of management support was listed as one of the top two obstacles to achieve a strategic impact with usability (Rosenbaum et al., 2000). As opposed to these

studies, the support of executive management was not seen as critical in Agile user-centric projects (Chow & Cao, 2008, p. 968).

Both project management skills and processes and good leadership skills are seen almost equally important in project management and UX oriented literature. Suitable project management skills are emphasized as a part of making the development process more systematic and improving the quality of the end results. (Chow & Cao, 2008; Rosenberg & Kumar, 2011.) At the same time, objective coaching and reinforcement of employees is seen to lead to more efficient employee behaviour and team performance (Schatz & Abdelshafi, 2005; Kotri, 2011).

Differencing from the success factors for project management in general, strong management templates may prove counterproductive in the highly interactive and adaptive nature of UX and CoPS environment, diminishing the role of users and user context in the development process (Baraldi, 2010, p. 42.). Instead, the quality and impact of UX aspects to the development process can be secured by recognizing the highly interactive nature of CoPS implementation and giving authority to UX experts and the customers (Rosenbaum et al., 2000; Hellman & Rönkkö, 2008; Sanders & Stappers, 2008; Baraldi, 2010; Kotri, 2011).

Transformation

Table 7. Comparative CSFs regarding the transformation of a project

	Project management literature (n=63)	UX related literature (n=15)
Skilled / suitably qualified / sufficient staff / team	32 %	20 %
Cross-functional research/design approach	0 %	40 %
Focus on supporting user tasks	0 %	13 %

Transformation carries out the tasks of the system (Fortune & White, 2005, p. 55). The literature findings imply that having a skilled team or staff is essential to the success of a development project both in general and in UX environment. Differing from traditional project transformation, it seems that in UX environment self-organized teams focusing on user tasks during the development projects lead to best results (Sobiesiak et al., 2002; Hecker & Berger, 2011). In addition, using cross-functional methods or design approach during the development is highlighted more in UX literature to answer the fast-pacing and innovative nature of UX oriented development projects (Rosenbaum et al., 2000; Vredenburg et al., 2002; Kotri, 2011).

Communication

Table 8. Comparative CSFs regarding the communication of a project

	Project management literature (n=63)	UX related literature (n=15)
Good communication/feedback	43 %	27 %
Close customer relationship	0 %	40 %
Internal/external communication of design methods	0 %	47 %

Communication reflects to the degree of connectivity between the components within the development project and its wider context (Fortune & White, 2005, p. 56). Compared to the single distinguished success factor in project management literature review, the UX related publications seem to contain more dimensions regarding communication. Both highlight the need for adequate communication during the development process. As opposed to project management literature, UX literature findings implicate a significant shift in communication towards customers or clients. Close relationship and communication with the customers is seen important in seven out of 15 publications. This is argued to enable a better focus on UX based goals based on customer requirements (Venturi et al., 2006; Rosenberg & Kumar, 2011). The positive impact of communication can be best achieved by focusing on personal contact, meetings and teamwork instead of less interactive ways such as mail exchange (Chow & Cao, 2008; Botzenhardt et al., 2011; Rosenberg & Kumar, 2011).

On the other end, lack of communication of the benefits of usability was a significant obstacle in achieving a bigger impact with UX, pointing out a need to speak the issues understandably with the partners in marketing, R&D and management (Rosenbaum et al., 2000, p. 343). The importance of communication within CoPS is particularly important due to the different levels of the system's perceived complexity between each individual which further can affect the resistance towards the new design approach. These types of problems can more easily be handled through communication. (Baraldi, 2010, pp. 36-38.)

The usability-related nature of UX is shown strongly when pointing out the CSFs of UX oriented projects. Shared understanding and internal and external communication of the design methods and goals seems to help making the development process more systematic and ease the coordination between employees (Detweiler, 2007; Kotri, 2011; Rosenberg & Kumar, 2011). According to Budwig et al. (2009, p. 3083), this will also increase the visibility of the UX teams within the overall organization.

Environment

Table 9. Comparative CSFs regarding the environment of a project

	Project management literature (n=63)	UX related literature (n=15)
Past experience (learning from)	8 %	40 %
Organizational adaptation/culture/structure	16 %	13 %
Environmental influences	10 %	0 %
Political stability	10 %	0 %
UX oriented culture/mentality	0 %	20 %

Environment is the wider unity which in this case the UX oriented development project and the organization interact with (Fortune & White, 2005, p. 56). Both project management literature and UX related literature acknowledge organization adaptation skills and evangelizing past experiences as success factors to enable a successful development project. However, when comparing the citation count between these two reviews, it can be seen learning from past experiences has been noted much more often within UX oriented project studies (six out of 15 publications) compared to project management in general (five out of 63 publications). One explanation for this might be that UX related literature has found it useful to utilize earlier case-situations and tools to motivate people. This often includes learning or evangelizing from past experiences. (e.g. Hecker & Berger, 2011; Jain et al., 2011.) It is seen to encourage innovative ideas, give better insight to perceived experience and enable a more efficient learning and adoption of the system (Hirsch et al., 2004; Schatz & Abdelshafi, 2005; Detweiler, 2007; Kotri, 2011).

Political stability or environmental influences do not seem to have any impact to the success of a UX related project. Adopting a UX oriented mentality throughout the organization is respectively seen important and has been found to improve the support for the development process (Hellman & Rönkkö, 2008). An exception of the success of adapting to the environment is within Agile projects, where an appropriate environment and culture is not a prerequisite for project success. This was explained by the emerging nature of Agile processes. The resulted success factors within Agile environment were team capability and correct delivery strategy. (Chow & Cao, 2008, pp. 968-969.)

Boundaries

Table 10. Comparative CSFs regarding the boundaries of a project

	Project management literature (n=63)	UX related literature (n=15)
Proj. size/complexity/no. of people involved/duration	6 %	13 %

Boundaries describe the aspects that separate the system (project/development process) from its wider system (organization/division) and the wider system from the environment (Fortune & White, 2005, p. 56). Neither project management literature nor UX related literatures seem to give a big emphasis on the aspects of boundaries that might assist or constrain the execution of a development project. Some single observations exist, such as findings that allowing micro teams to form within a given location is seen beneficial. Furthermore, working without formal project management or lacking clear roles regarding whom is the primary designer cause problems or significant decreases in productivity in UX environment. (Jain et al., 2011, p. 530.) Vredenburg (2002, p. 475) also found that centralized organization emerged as a predictor of perceived UCD effectiveness. The relatively small amount of findings may derive from the case-dependency of each situation, making it hard to form any universally accepted factors.

Resources

Table 11. Comparative CSFs regarding the resources of a project

	Project management literature (n=63)	UX related literature (n=15)
Sufficient/well allocated resources	25 %	40 %
Training provision	11 %	33 %
Adequate budget	17 %	0 %
Proven/familiar technology	22 %	0 %
Good performance by suppliers / contractors / consultants	16 %	0 %
	0 %	33 %

Resources can be physical, organizational and monetary resources and they are appointed to the development project (Fortune & White, 2005, p. 56). Both project management literature and UX related literature highlight the importance of sufficient and well allocated resources. It is seen as the one of the most basic pre-requisites for cross-functional integration and collaboration (Judy & Krumins-Beens, 2008). It is also

said to secure the UX vision of the product throughout the development process (Hellman & Rönkkö, 2008, p. 32). In addition, many studies have found that lack of resources have led to problems in collaboration issues during development process or achieving any strategic impact with UX (Rosenbaum et al., 2000; Chamberlain et al., 2006).

Providing organized and continuous training during the development project is highlighted substantially more frequently in UX environment than within traditional project management. Lack of training was also listed as one of the biggest obstacles in making a strategic impact with usability (Rosenbaum et al., 2000, p. 344). This could be explained by the fact that user experience and UCD can be considered as a new design approach. Lack of UX understanding and resistance to user-centered design were listed as critical factors that can restrict the impact that can be made with the product's UX vision (Rosenbaum et al., 2000, p. 340). This implies a need to educate internal groups within the development project and the organization about the benefits and practices of UCD (Rosenbaum et al., 2000; Meyer & Schwager, 2007; Hecker & Berger, 2011). Organizational teaching and user training is seen particularly important in CoPS where the complex nature of the system itself lead to more challenges among the development team and the clients (Tidd et al., 2005, p. 267; Baraldi, 2010, pp. 36-38)

The large percentage of studies emphasizing sufficient resources could partly explain the absence of highlighting adequate budget in UX related projects since both terms involve a lot of similar aspects. The novelty of user-centric design may prevent UX related studies to recommend this for development projects. Instead of noticing good performance by different partners and stakeholders, UX literature seems to highlight more on establishing a strong communication infrastructure (Sobiesiak et al., 2002; Hecker & Berger, 2011).

Continuity

Table 12. Comparative CSFs regarding the continuity of a project

	Project management literature (n=63)	UX related literature (n=15)
Risks addressed/assessed/managed	21 %	0 %
UX guarding functionality in product development	0 %	7 %

The continuity dimensions provide some guarantee of continuity for the development project (Fortune & White, 2005, p. 56). In UX environment, this could reflect to ensuring that the product's or organization's UX vision is being secured throughout and

beyond the individual development project. UX related literature does not seem to give emphasis on risk management on the same scale compared to traditional project management. One reason for this might be that UX - despite of being a critical part of the development process – does not consider development projects at such large scale than project management literature in general. Instead the highlight is on UX guarding functionality in product development in order to secure the product's intent on UX matters (Hellman & Rönkkö, 2008). Partly related to this matter, the involvement of senior management and customers to the development process has been found to secure that UX is not only perceived as a design tool with low importance but an important part of product development which further on reinforces the image of UX being a key competitive factor of the company (Sward, 2006; Baraldi, 2010; Hecker & Berger, 2011).

Other factors:

Table 13. Comparative CSFs regarding other factors of a project

	Project management literature (n=63)	UX related literature (n=15)
User/client involvement	38 %	33 %
Different viewpoints (appreciating)	5 %	0 %
Project sponsor/champion	19 %	0 %
Effective change management	30 %	0 %
Selective recruiting of employees	0 %	7 %

User or client involvement is seen as a significant factor in both project management literature and UX related literature. Methods of innovation through customer involvement according to Sanders and Stappers (2008) are for instance open innovation and co-creation of products and services. Customer or user involvement is seen to lead to a more customer-oriented development, enable customer-oriented innovation and get better insight to the perceived UX by the customer (Frow & Payne, 2007; Hecker & Berger, 2011; Jain et al., 2011; Kotri, 2011). Involving customers and users closely in the development is seen to be especially important in complex systems environment where the characteristics of the system add another dimensions of complexity. This can lead to resistance towards the new system. (Baraldi, 2010, p. 35.) Instead of imposing a ready solution to individual users they must be involved and extensively try to use the product in order to change their established work routines and adapt to the new design approach more effectively (Tidd et al., 2005, p. 267; Baraldi, 2010, p. 33). Lettl (2007) adds that when customers are involved in innovation processes it is important to

consider which users are capable to provide valuable inputs in innovation projects and what interaction patterns are the most appropriate.

To summarize the findings, the following list contains the success factors that have been found to work in both project management literature and management of UX related development and what UX related literature has emphasized solely in UX related project (Table 14).

Table 14. Similarities and differences on the success factors of project management and UX related development projects

	Common success factors	**UX-specific success factors**
Goals and objectives	Strong business case/sound basis for project	Target-group oriented strategy and UX incentives instead of clear objectives
Performance monitoring	Effective monitoring/control	Validating customer requirements and review sessions
Decision maker(s)	Support from senior management, suitable project management and leadership skills	Strong management templates may prove counterproductive. Emphasis on authorizing UX experts and customers.
Transformation	Skilled/suitably qualified/ sufficient staff/team	Cross-functional design approach Focus on supporting user tasks
Communication	Good communication/feedback	More communication towards the customer and of design methods Importance to enable communication between departments, (marketing, R&D, management)
Environment	Organizational adaptation skills	Evangelizing past experiences has a much bigger influence Environmental influence smaller Importance of UX oriented culture
Boundaries	Small amount of findings Case dependency	-
Resources	Sufficient/well allocated resources	Training highlighted more during development process Establishment of a strong communication infrastructure
Continuity	None	Enabling UX to guard functionality in product development
Other factors	Customer/user involvement in development process	Absence of project sponsor and change management in development process

In the following chapter the central findings of the literature review made above will be reflected to the management behaviour in UX oriented development projects. These results may give implications of how managers involved in the development projects should adapt their behaviour in order to create competitive advantage with user experience to the development project and on larger scale to the organization.

2.4 Implications to project management

As an implication of the success factors described in the previous sub-chapter, Figure 4 summarizes the success factors expressed in project management and UX related project management literature. The three larger rectangles distinct between factors mentioned specifically in project management literature, common success factors mentioned by both literatures, and factors highlighted in UX related project management literature. The smaller rectangles are the expressed success factors. The size of the smaller rectangles reflects to the frequency of occurrence of the success factor combined with their relative, author-dependent criticalness within literature. The position of the rectangles within the circles reflects to their relevance to each project management area based on the relative frequency of occurrence of the specific CSF in each research area. Each group with the same color represents the success factors from an individual dimension. Due to the result that any boundary was not seen to significantly affect the success of the development project, this dimension is not expressed in the figure.

As discussed in the previous chapters, due to the limited amount of user experience studies in CoPS literature some findings were taken under a slightly different topic, such as Agile software development projects and Customer Experience management. As these areas were identified to be somewhat relational to the theme in this research and their findings supported by the findings in the literature of user experience (e.g. Rosenbaum et al., 2000; Hellman & Rönkkö, 2008; Rosenberg & Kumar, 2011) and complex systems (e.g. Baraldi, 2010; Hecker & Berger, 2011), some implications to user experience management can be drawn from them. When found necessary, distinctive factors between the different research areas within UX environment will be pointed out. Comparing these factors will give some insight of how the transformation and management of development projects should be adapted in UX environment.

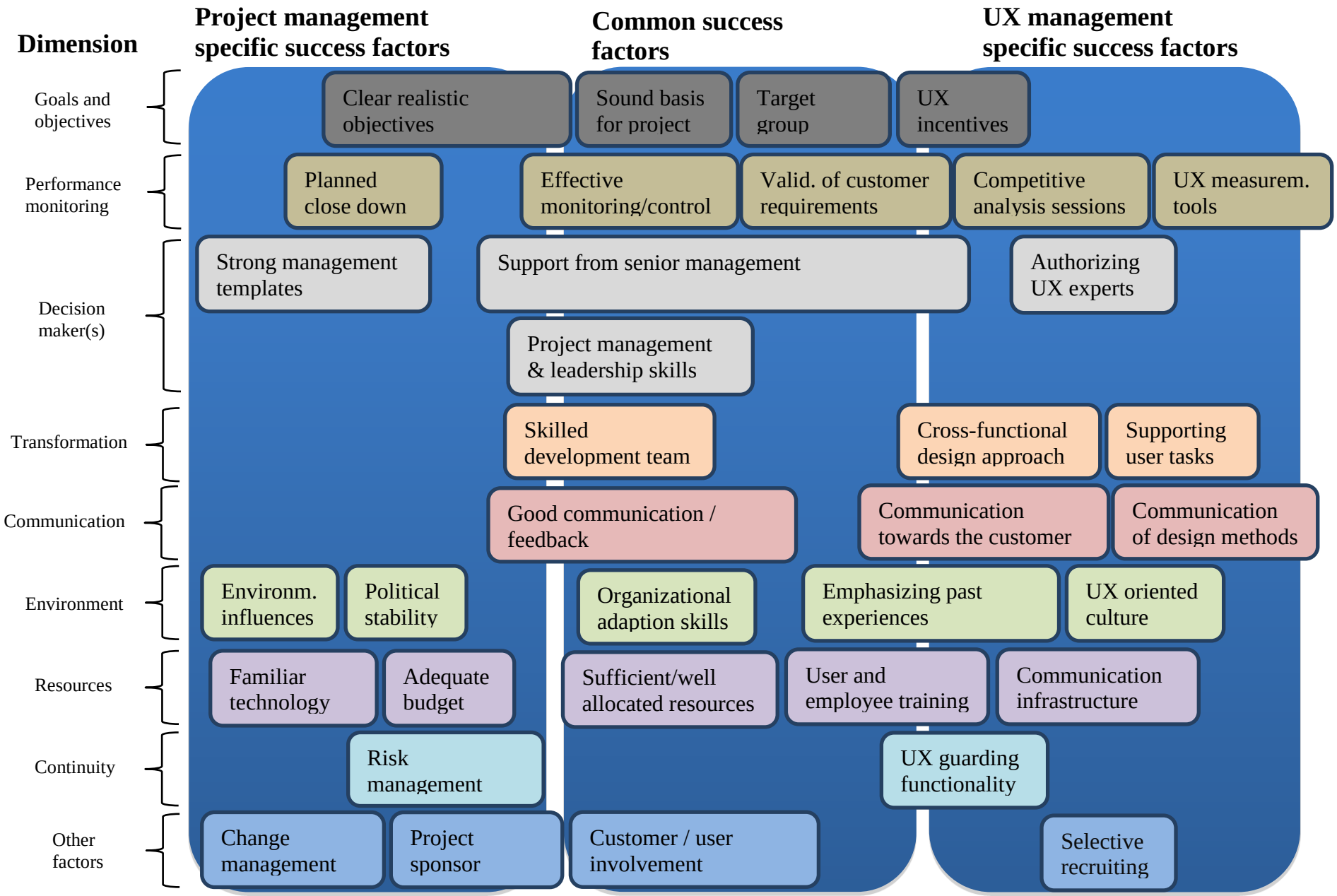

Figure 4. Comparison of the success factors between project management and management of UX related development projects

The managers are argued to be responsible for creating an UX strategy together with the relevant business units for the product, transforming the UX goals into the strategic goals company and giving the development process adequate support in order to create a strategic impact. They should provide adequate support and commitment in the user experience development projects. This is seen to lead to bigger impact among the employees and furthermore in the organization. (Venturi et al., 2006). As stated by Schaffer (2004), they are not directly related to the progression of the project. However, they often act as enablers of creating the UX oriented organization culture, making them essential in carrying out such development projects.

When crafting the goals and objectives for the UX related development project, the most important things that managers are advised to do is to ensure that the project will be made on a real need and with a high priority in the organization (Venturi et al., 2006; Jain et al., 2011). Creating a clear vision for the objectives are found important but even a stronger emphasis is laid on directing the strategy towards the right customer segment and providing incentives in order to keep the development striving towards the desired direction (Jain et al., 2011). Managers who have some understanding and interest towards UX is seen as a positive factor that has led to improved awareness, communication, effectiveness and better management support in product development processes (Venturi et al., 2006; Chow & Cao, 2008; Hellman & Rönkkö, 2008).

Literature findings implicate that people with the right management status should maintain a continuous monitoring and controlling process, focusing on validating customer requirements early in the development process, holding review sessions during the development process and using UX measurement tools (Jain et al., 2011). The decision makers should ensure support from senior management and choose a person with suitable project management and leadership skills to lead the project. Strong management tools and detailed plans have been found to diminish the role of users and user context and prove counterproductive in developing UX in complex systems environment. A more user-centric, adaptive management style is seen to lead to more positive results with an emphasis on authorizing UX experts. (Baraldi, 2010, p. 42.)

Having a skilled development team is seen crucial during the development process. The managers should ensure that people from different departments are coordinating the development together that the requirements of the development arise from the actual needs of the end users (Sobiesiak et al., 2002). Continuous communication with the customer together with internal and external communication of design methods is found to make the design better correspond to customer requirements and improve the understanding of the chosen methods (Rosenbaum et al., 2000; Rosenberg & Kumar, 2011). In order to enable a good communication and improve the user-centric mindset,

the resources are recommended to allocate more towards user and employee training and communication infrastructure than in classic development projects (Meyer & Schwager, 2007; Chow & Cao, 2008; Jain et al., 2011).

UX oriented project management is advised to help creating the right culture and evangelizing past experiences in order to motivate the employees about the benefits of the product's UX matters (Schatz & Abdelshafi, 2005; Jain et al., 2011. An adaptive management style is the pre-requisite for organizational adaption skills (Rosenberg & Kumar, 2011). Instead of highlighting the risk management aspects, UX management is recognized to gain from ensuring that UX is guarding the functionality in product design, securing the product intent on UX matters (Hellman & Rönkkö, 2008). The customer-oriented vision of the product will be secured and defined by involving customers in every phase of the development process (Škrabálek et al., 2011, p. 3).

Considering the applicability of the findings to the UX related research areas, publications focusing on UX and Agile development have found some differences that are important to point out. On management aspects, instead of counting on traditional project management scheduling, the managers involved in the development process should become more actively involved than they normally might. (Detweiler, 2007, p. 40.) The impact of strong executive support and management commitment is not seen as critical in carrying out an Agile project (Chow & Cao, 2008, p. 968.). However, other authors found out power struggles and communication issues and proposed a need for balancing power to overcome these conflicts (Chamberlain et al., 2006). Regarding project transformation, the way of spreading the different phases of UCD over the entire development life cycle is modified in Agile development to be repeated across sets of sprints or milestones. Sequential processes are made often in parallel manner which may require more UX headcount to do the same work. (Detweiler, 2007, p. 40.) According to Kollmann et al. (2009, p. 17) UX and Agile development can be fitted together with a good understanding of both approaches and flexibility in work practices.

2.5 Synthesis of theoretical perspectives

As defined by ISO (2010b), user experience can be defined as the person's perceptions and responses resulting from the use and/or anticipated use of a product, system or service that occur before, during and after the use of a product. Besides focusing on the actual product, user experience withholds also the brand image, assistive capabilities and the context of use with the product (ISO, 2010).

The business benefits of UX have been proven to exist in both B2C and B2B context (Garrett, 2006; Venturi et al., 2006; Škrabálek et al., 2011). The importance of UX and user-centric design has grown also in the context of complex industrial systems and becoming a key factor for competitive advantage (Baraldi, 2010; Hecker & Berger,

2011). However, the benefits of usability are seen difficult to measure due to the abstract nature of the benefits, and more importantly, the perceived benefits are relative due the different perspectives and priorities within the various groups of the development and use process (Škrabálek et al., 2011, p. 10). Literature results imply that if UX can be linked to strategic goals and organizational functions properly, it will have a positive effect to the profitability of a company. In contrast, if UX is seen only as a secondary function, it will more likely have only minor benefits to the company (Baraldi, 2010).

Literature findings confirm that there is a need to involve a person with sufficient decision-power in the development process (Venturi et al., 2006; Škrabálek et al., 2011). Managers are seen to have the responsibility to define the product strategy and a roadmap, break it down into product development releases with associated business requirements, help the development teams to understand and transform the requirements into work packages, manage the go-to-market and ensure proper product support (van de Weerd et al., 2006; Kittlaus & Clough, 2009). As a result, the involvement of managers is seen not only in the part of strategic decisions, but in every part of product development process (Venturi et al., 2006).

User-Centered Design and Human-Centered Design processes are systematic approaches to system design and development that aim to shift the development process more based on the needs and requirements of the users and use context (ISO, 2010). In UCD and HCD, the humans are taken into consideration as soon as possible during the design processes and kept as evaluators of the development throughout the process (Sazonov, 2011, p. 8).

In order to distinguish the similarities and differences of managing user-centered design to traditional project management, a comparison of the success factors between these two research areas were made. As a prerequisite for this comparison, a review of the success factors on project management made by Fortune and White (2005) was presented. It consisted of 27 success factors mapped in nine different dimensions called the Formal System Model. In order to enable a comparison of this in UX environment, a review of the publications that identify the success factors in UX related literature was made. These were mapped into the dimensions of the FSM and compared to the success factors on classic project management.

As a result of the comparison, some valuable implications were made. Some findings on project management seemed to be applicable to UX environment. The aspects that could be most commonly adapted related to skills and processes that can be understood as fundamental competitive factors for an organization, including leadership and management skills, skilled or suitably qualified development team, management support, sufficient resources and good communication. From these factors, support from

senior management is seen the most critical factor, influencing the credibility, visibility, and cost-effectiveness of the development project (Rosenbaum et al., 2000; Kotri, 2011). Managers who have some understanding and interest towards UX is seen as a positive factor that has led to improved awareness, communication, effectiveness and better management support in product development processes (Venturi et al., 2006; Chow & Cao, 2008; Hellman & Rönkkö, 2008). Additional success factors that were found to have a positive effect in UX related project were ensuring that the profile or design approach had a high profile (e.g. Jain et al., 2011), enabling effective and continuous monitoring and controlling (Chow & Cao, 2008; Kotri, 2011), having a lean and adaptable organizational structure and involving clients and users in the development process (Hecker & Berger, 2011; Kotri, 2011).

Some aspects that have been proved to exist within classic project management literature seem to be remote or even prove counterproductive in UX related publications. Counter wise, there were all together several within UX related publications that were not mentioned as a CSF in project management literature. In many cases these are consequences of the more customer and user-centric design approach. As opposed to clear and realistic objectives a more customer-oriented strategy (Jain et al., 2011; Kotri, 2011) with providing UX related incentives have been found to lead to success in UX environment (Venturi et al., 2006). Having a way to measure customer requirements and UX aspects will help to keep track and provide support for the development (Detweiler, 2007; Rosenberg & Kumar, 2011). Most credible development process has been found to derive from involving clients or users to the actual development process (Chow & Cao, 2008; Jain et al., 2011).

Besides emphasizing the importance of the customer, the role of communication and a holistic development process are seen crucial in within UX. This is seen to improve the understanding of the chosen development methods within the organization and increase the internal and external appreciation towards the product's UX aspects (Rosenbaum et al., 2000; Rosenberg & Kumar, 2011). This together with some valuable UX tools is needed to create a user-centric mindset culture inside the organization. To enable this resources are recommended to allocate more towards user and employee training and communication infrastructure than in classic development projects (Meyer & Schwager, 2007; Chow & Cao, 2008; Jain et al., 2011).

The differences of the success factors enable to distinguish the elements of project management that literature results seem to highlight in UX environment. The case dependency of the success factors were found common in development projects in both general level and in UX environment. In order to utilize the great amount of available methods and tools for acquiring UX into the product development effectively, the

organization should understand what methods should be used in what stages and contexts of the development project (Sazonov, 2011, p. 14).

The results described above give some insight of what literature has resulted for the success factors on development project management and transformation in UX environment. This gives some implications of the different dimensions that should be tackled by product and project managers. As a continuum for this theory, empirical interviews will be conducted with the two chosen case companies. This will give valuable perspective of how two UX oriented development processes have actually been managed. Furthermore, the interviews give a valuable chance to see how the results of two development projects in CoPS context relate to the literature findings.

3 RESEARCH METHOD AND MATERIAL

3.1 Case method and research material

3.1.1 Material collection

As mentioned in the introduction, a case-study research approach was taken to answer both the empirical and theoretical requirements of this thesis. A case study gives a chance to get rich qualitative research data which helps answering the practical "how" and "why" research questions in the case context. Additionally, the case study approach brings particular advantages in contexts – such as user experience management – where little previous empirical research is available on the subject (Eisenhardt, 1989, p. 536). The empirical material from the cases are mainly derived from the multiple qualitative, semi-structured interviews made with the managers involved in the R&D, project management and sales and marketing processes of UX related product development processes. A person involved in the purchasing decision of a case-company's product was interviewed to get an objective opinion of how the intended actions of creating value through user experience have been delivered to the customer and affected the buying decision for the product.

Participating in the UXUS program gave certain privileges regarding the interviews. First, it enabled an access of multiple other interviews made with other persons involved in the management and transformation of UX related actions. This enabled access to more rich qualitative information which could not have been manageable solely within this thesis. Additionally, having both case companies involved in the same program helped the parties feel more like "belonging to the same team". It may have enabled to diminish the traditional researcher – practitioner gap during the interviews to some extent. However, the role of an external researcher has been promoted during the interviews to some extent.

The possible distortions may be the biggest in the interviews conducted among the customer representatives. The persons involved in the purchasing decision know that the researchers cooperate with their supplier and therefore might not tell their honest opinion about the questioned matters. Equivalently, the majority of the interviews were conducted with the supplier company, which may have caused some biases in the result. Furthermore, due to the time and resource constraints, no interviews could be conducted with any customer companies of KONE.

Figure 5. The collection of the research material

All together 19 interviews were used as the basis for the results (Figure 5). The researcher participated in six interviews. The results were completed with relevant material taken from 13 interviews of other researchers conducted earlier in both case companies. These interviews were held by other researches within the UXUS program at Tampere University of Technology. These interviews were held on a similar topic and a significant amount of results could therefore be drawn from them. All the interview material is presented below (Table 15). The position of the person describes the person's status in the company when the interview was held. The bracketed numbers tell if there have been multiple interviewees with multiple persons with similar position in the company.

Table 15. Position and amount of interviewees

	Interviewees position / Case company	Interviewee status / Customer company (C1/C2)
Fastems	• Project manager • R&D Manager (2) • Sales Manager (3) • Product Manager • Director, International Sales • Director, Marketing & Business Development • Director, New EU countries	• C1: Manager of Software Contracting and Technical Development • C1: Production Manager • C1&C2: Purchasing Manager
KONE	• Project Manager (2) • Senior UX Specialist • Segment Manager • Director, New Equipment Business • Marketing Manager	

The first supportive material was drawn during the second quarter of 2011. The rest of the interviews made by other researchers were conducted during the first two quarters of

2012. The interviews of the researcher himself were conducted during the third and fourth quarter of 2012. Tape recorders were used in the interviews and the records were transcribed in a written form for further investigation.

3.1.2 Interviews

As noted previously, all together 19 interviews were used as the reference material of this thesis. The material for the UX management research was obtained by interviewing persons from different management levels. On the case of Fastems Oy Ab, a total of 13 interviews were held. The level of executives varied between coordinators of a specific development project to a sales manager. The interviewees were either a part of the actual development project team which carried out the transformation of the MMS5 control system project or the executive group of the project which coordinated the major issues regarding resources and the big picture. On the case of KONE Oyj, the interviewed persons ranged from UX specialists to the country sales managers. The focus of the interviews was more about asking the employees' points of view and experiences about their recent UX oriented projects in general. All together six interviews were conducted with the employees of KONE Oyj.

Additional to the reference material from the interviews, there were multiple discussions and common workshops together with the UXUS contact person of each company. These were typically held within the UXUS project gatherings in Helsinki and Tampere and helped to understand the strategic goals of the companies regarding UX matters. These discussions also helped to craft the focus of each case study. The interviewed people from the customer companies were contacted via the UXUS contact person in the case company. The persons interviewed were involved in the purchasing decision of the system, either being the person responsible for the actual buying decision or involved in evaluating the buying criteria.

The structure of all of the interviews went along with the definition of Fontana (2002) and Saunders (2009) on semi-structured interviews. Regarding the preparation for the interviews, some prior planning was made to increase the level of knowledge about the interview and case context, and to be able to get more valuable answers from the case companies. The case companies had been involved in other studies of UXUS program. Accessing the old interviews gave already some answers to this study. In order to avoid repetition in the interviews, the questions made specifically for this study were more focused on matters that had not yet been discussed with the interviewees.

Some general topics were prepared before the interview. The first theme was typically about the background and position of the interviewed person. Regarding the research context, some general themes and questions were prepared about the scale, complexity, and amount of interest groups involved in the development projects. The themes

regarding the management aspects of planning, transforming, implementing and completion of the project were covered with various themes directed to the managers and experts involved in the development process. Furthermore, the themes and questions aimed at people involved in the sales process were covered with general questions of how did the UX characteristics affect the flow and people involved in the sales process. The structure of one interview from each case is shown in appendices 1 and 2.

The actual interview situation did not have a complete script and the questions were rather made in an informal, open-ended structure. Thus, the conversation evolved quite naturally and sometimes diverged from the prepared topics. This gave the benefit to focus the discussion on relevant topics for both the interviewer and the interviewee. In addition, some matters could be discussed with more detail when found necessary. A semi-structured interview was seen to suit best for the purposes of the study. If done right, it can provide reliable, comparable qualitative data (Cohen & Crabtree, 2006).

The case companies act as the supplier of the product or system. The persons were asked about their role in their development process and their own opinion on how the UX goals of the company were utilized their personal goals and during the development project. Furthermore, the interviewees were asked about the impact of UX in their management work and in the transformation process of developing, producing and delivering the final product to the customer. The goal of the interviews was to get the view of the practitioner of the importance of UX in their own behaviour and in the development organization. On a larger scale, the aim was to get an inside-opinion on what is the impact of UX in the management processes and on the organizational culture.

Suitable customer companies were selected in such manner that it had purchased a product or a system which was developed and produced with user-centric methodologies. The chosen persons in the customer company involved in the buying process of a system were asked about their role in the purchasing process and what were the purchasing criteria for the product or system. Furthermore, the persons were asked whether certain matters linked to UX had an effect in the purchasing criteria of the product. The goal was to find out whether the intentions of the supplier company for delivering value through UX had remarkably affected the behaviour in the purchasing decision.

Although qualitative interview is the most common and one of the most important data gathering tools in qualitative research, it is prone to some errors and biases. Typical methodological limitations are related to the interviews of this thesis. The challenges include twists or distortion of the results due to the artificiality of the interview situation, lack of time during the interview and biased opinions of the practitioners.

(Myers & Newman, 2007.) There is a chance that poor questions have been asked. Because the interviewer and interviewee were close to strangers to each other, there is a chance of reflexivity: the presence might have caused a change in what people did or what they said. Also, the high level of expertise of the interviewees about the interviewed matters could have caused some basic yet important facts to be dismissed as they have seemed too obvious or common.

The interviews with the customer companies were overall a challenging concept regarding the credibility of the results. In these situations the interviewee was aware that the focus of this study was to improve the position of their supplier. Hence, the interviewees might not have revealed all of the facts regarding their purchasing behaviour which could have led to skewed results. Another source of distortion is the fact that a substantial part of interview material was not conducted by the researcher himself. Working only with the transcriptions and tape recording of the interviews might have led to misinterpretations by the researcher.

3.1.3 Material analysis

The analysis of qualitative data is considered to be a demanding process and there is no standardized procedure to do it. However, there are multiple ways to get something valuable out of the collection of non-numerical and non-standardized data. Saunders et al. (2009, p. 490) have grouped qualitative analysis into three main types of processes: summarizing data, categorization data and structuring data using narratives. To enable a rich material analysis, the interviews were tape-recorded and subsequently transcribed, that is, reproduced as a written account using the actual words. Data summarizing aims to bring out the key points and themes and possibly identify relationships between them. As opposed to this, categorizing data involves developing categories, followed by attaching these categories to meaningful chunks of data. Through this it is possible to recognize relationships or develop the categories further. Additionally, the data can be structured using narrative that organizes the data temporally and with regard to its social or organizational context. (Saunders et al., 2009, pp. 491-498.) The aim of this process is to aid to interact with the data in order to comprehend the data, integrate related data drawn from different transcripts and notes, identify key themes or patterns from them for further exploration, develop and test theories based on these apparent patterns or relationships and draw and verify conclusions (Miles & Huberman, 1994).

In this thesis, the data from the interviews is put in the form of stories. Two narratives, one per each case are formed to make a rich description of how the UX related development process proceeded, how were they managed, which methods were used and which challenges were met in different stages of the development. Straight quotations of the practitioners involved in the development process are included in the text. Due to the qualitative approach of the research method, the key performance

indicators for the CSFs will also be derived from interview answers. Since the answers are based on subjective perceptions, the evaluations are likely to involve some twists and distortions. This will be further discussed in the conclusions section.

The focus of the interview material has some intrinsic differences between the chosen case companies. In the case of Fastems, the interviews were mostly focused on the development of the FMS control system MMS5. As opposed to this, the interviews of KONE were more focused on bringing viewpoints and experiences from multiple user-centric projects (Figure 6). This has a crucial effect on the representation of each case regarding the studied phenomenon. On the case of Fastems, the role of the narrative is to be an exemplary UX related project. Hence, the goal is to frame the project results to the success factors of UX related project management presented earlier in chapter two and analyze the similarities and differences that might occur. On the other hand, with the case of KONE the purpose is to draw findings on multiple project cases on the perceived effectiveness of each project dimension. Furthermore, the results will be compared with the reference-based CSFs for each project management dimensions. Thus, the aim is to provide conclusions of how the literature-based CSFs should be adapted to the environment of industrial complex systems.

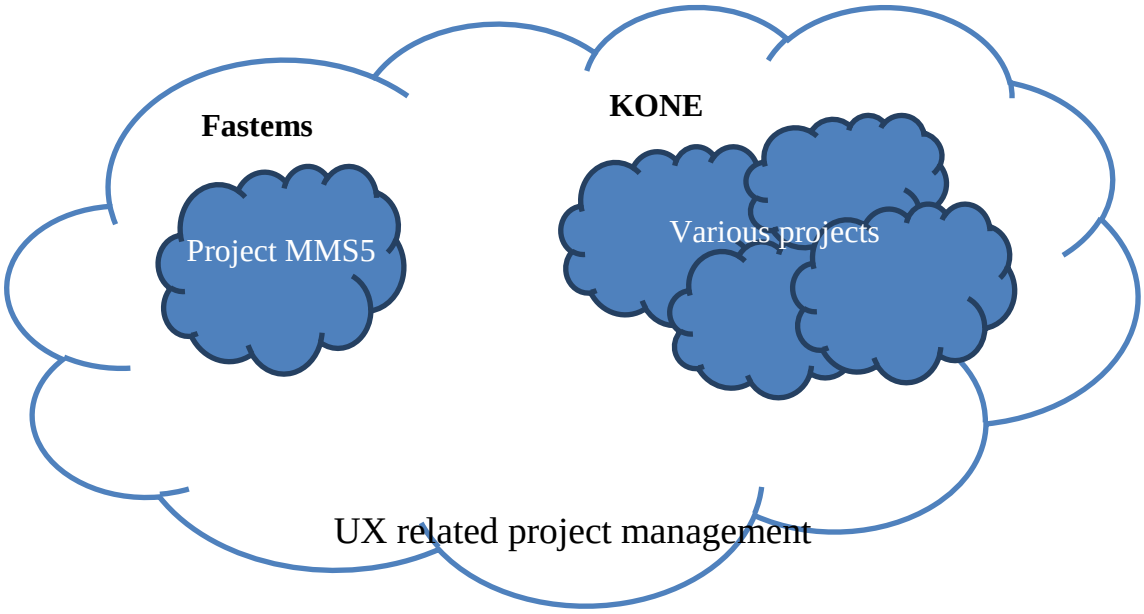

Figure 6. Relationship of the cases to the studied phenomenon

After presenting the narratives of both cases, the aspects of the development process itself will be put in the dimensions of the Formal System Model. Using the FSM as a framing device will help examining the development processes in a consistent manner. Comparing two rather similar development contexts will give a good opportunity to evaluate the transformation of two similar development contexts. Furthermore,

reflecting the transformation process to its impact in the internal organizational and to the customer's behaviour will give comparative results on how the success in each project dimension has reflected to the success of the whole development process. Finally, the results are compared to the literature implications made earlier for UX related development projects. The similarities and differences between the theoretical and real-life findings will be highlighted so that joint implications can be drawn. This comparison will lead to a better understanding of the effectiveness of different management means and methods that are utilized as companies are adopting a user-centered design process.

3.2 Case companies

Two case companies, Fastems Oy and KONE Oyj were preselected for the purposes of the background project. As already pointed out in the introduction chapter, small amount of companies can lead to distortions in distinguishing the success factors (Bevan, 2009). Therefore the most suitable approach will be to test and compare the factors of the created model with the empirical findings of the two companies. This dialog may lead to possible expansions or adjustments to the theoretical foundation based on the research material. Focusing on two cases in similar industrial context gave to opportunity to have rich qualitative data from a particular phenomenon that may be utilized in further researches covering the same theme. By defining the nature and industrial context of the case companies and their on-going development project it is possible to make comparative results of the applicability of the model in certain environment. In the next chapters some relevant background information about the case companies is presented.

3.2.1 Fastems Oy Ab

Fastems Oy Ab is a global producer of flexible manufacturing systems (FMS) and robot cells for automating metal cutting CNC machine tools, and a provider of automation-related services. Their vision is to enable effective use of machine tools throughout the 8760 hours in a year. Their turnover in year 2011 was 80.6 million Euros with an operating profit of 1.1 million Euros and 413 employees worldwide (Fastems, 2011). The company is owned by a privately owned parent company, Helvar Merca Oy Ab (Helvar Merca Oy Ab, 2012). Their headquarters is located in Tampere, Finland. In addition, they have a total of nine subsidiaries worldwide, located in Europe, in the United States and Japan. (Fastems, 2010.)

Their history is rooted in the machine division of Mercantile – a company founded in 1901 in Tampere, Finland. Production of FMS started in year 1982 in a Finnish company called Valmet. Fastems was established as a result of merging Valmet Factory Automation with Mercantile in 1995. (Fastems, 2012.) Fastems has traditionally

focused on the markets in Finland and other EMEA countries. However, there is a strong trend to expand to American and Asian markets. In year 2010, the sales from Finland yielded up to 45% of total invoices while the whole EMEA area represented 92% of total sales. (Fastems, 2010). According to the sales manager of Fastems, the latest figures for sales to EMEA cover 76% of all invoices, whereas 17% and 7% are coming from Americas and Asia-Pacific, respectively (Figure 7).

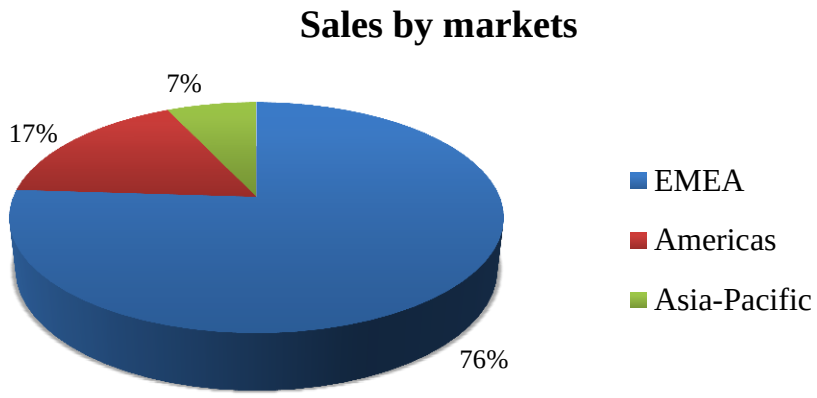

Figure 7. Fastems sales by markets (adapted from Fastems, 2011)

The biggest customer segment includes the aerospace industry, which generated 40% of the sales in 2011 (Fastems, 2011, p. 8). Other important customer include construction and mining machinery industries, built-to-order vehicle manufacturers, general machine builders (such as printing, food, forest machines, and machine tools), mechanical engineering companies (such as gear wheels, engines, and instruments), and component manufacturing and assembly factories (Fastems, 2012). The operations consist of two business lines, Flexible manufacturing systems and robotics. Both of the divisions hold around 100 direct employees (Figure 8) (Fastems, 2011, p. 11).

The relative large amount of personnel in customer service and sales can be explained by close customer relationships and large proportion of services in their business. In 2011 the service unit was able to exceed the sales budget in all areas. Fastems has both local service offices as well as and remote support (Teleservice) and spare part service capabilities. Service agreements vary from single machine maintenance agreements to extensive Full Care agreements. (Fastems, 2011, p. 9.)

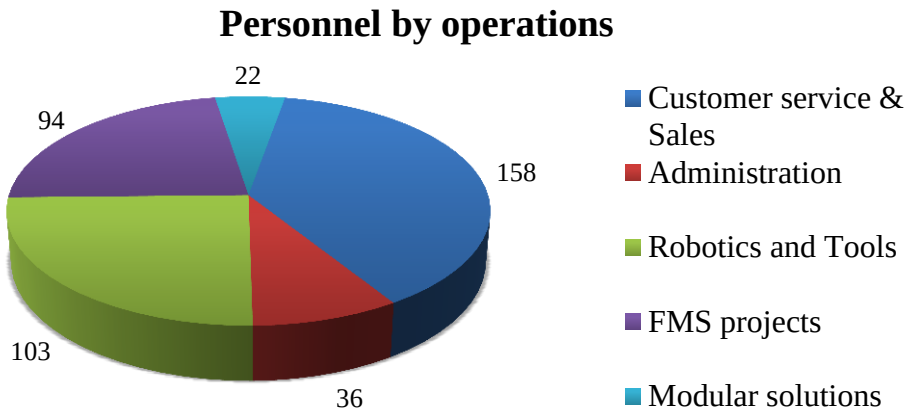

Figure 8. Fastems personnel by operations (adapted from Fastems, 2011)

Regarding the development of user experience at Fastems, UX has been a critical goal in the development of their new FMS control software called the Fastems Manufacturing Management Systems (MMS5). Besides aiming at providing good user experience in a single manufacturing cell controller, its purposes extends to workshop level management software with integration to ERP system, aiming to provide intelligent resource planning, predictive scheduling and real-time production reporting to the customer company. (Fastems, 2012.) An example of the control module is shown in Figure 9.

Figure 9. The control module of MMS5 (Fastems, 2012)

3.2.2 KONE Oyj

KONE, founded in 1910, defines itself as one of the global leaders in the elevator and escalator industry. KONE has its head office in Helsinki, Finland. In 2011, KONE had annual net sales of 5.2 billion Euros and on average 35,000 employees. The ownership of the company is mostly divided to members of the same family by four generations. Their KONE class B shares are listed on the NASDAQ OMX Helsinki Ltd in Finland. During its history as an industrial engineering company, KONE has been involved textile manufacture, medical technology and hydraulic piping systems. Their main focus has always been the elevator and escalator business which today consists of providing its customers with elevators, escalators and automatic building doors as well as modernization and maintenance services. (KONE, 2012a)

The KONE organization is divided into two business lines, Service Businesses and New Equipment Business, and five geographical areas, Central and North Europe, West and South Europe, Greater China, Asia-Pacific and Middle East, and the Americas (KONE, 2012a). In terms of sales, Service and New equipment businesses are almost equally sized, representing 54% and 46% of the sales (Figure 10). Marketwise the sales were divided so that 55 % of the sales came from EMEA, 18 % from Americas and 27 % from the Asia-Pacific (Figure 11). (KONE, 2012b.) The company has eight global production units located in their main markets. In addition, KONE has authorized distributors in over 60 countries and operate through more than 1,000 offices around the world (KONE, 2012a).

Their key customers include builders, building owners, facility managers, and developers. The main customer segments are residential buildings, hotels, office and retail buildings, infrastructure, and medical buildings. In addition, architects, authorities and consultants are key parties in the decision-making process regarding elevators and escalators. (KONE, 2012a)

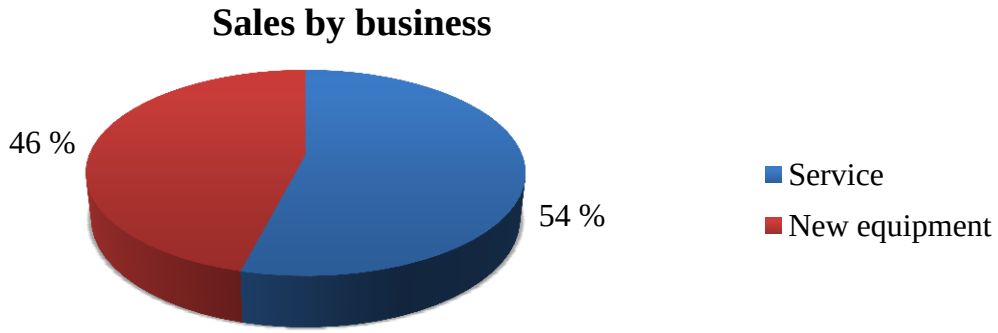

Figure 10. KONE sales by business lines (adapted from KONE 2012b)

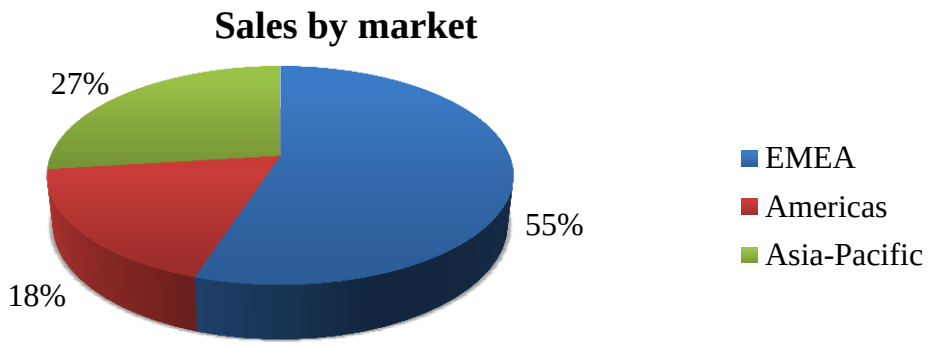

Figure 11. KONE sales by market segments (adapted from KONE 2012b)

User Experience and Customer Experience is shown clearly in the organizational level. Since 2008, the company's has placed a strategic objective to offer the best user experience with People Flow™ solutions for their customers and end users. For the customers, People Flow is aiming to work closely with the customers during the design and building phase of the project. Maintenance and modernization solutions are provided after the installment of the equipment. For the end users, People Flow aims to deliver solutions that aim to enable people to move smoothly, safety, comfortably and without waiting in buildings. In addition, KONE has also established a new Customer Experience business unit to further enhance its customer focus. (KONE, 2012a.)

3.2.3 Comparison of the development programs

Both of the case companies operate in an environment where the users of the systems are rarely involved in the purchasing decision. Furthermore, the case companies have to consider how to act in a situation where the purchasing criteria can differ from the values when using the product. Both studied companies are involved in processes where UX can be seen to be having an important role. In spite of the fact that both of the presented case companies act in UX environment, they can be seen to differ from certain aspects. Pointing out some key differences between the two development programs will help understanding the different development context of the two case companies. Moreover, the differences in the nature of the programs and the organization can explain some of the possible fluctuations in the results of the case narratives.

At Fastems, UX can be regarded as a growing phenomenon. Before the development of the FMS control system MMS5, the development projects could be more understood as "typical engineer-led projects", which according to the company's employee were typical to the flexible automation industry. Even though some earlier projects had some aspects of a human-centric project, the development project of MMS5 was their first real project which was conducted with a clear UX vision. Based on the interviews, this was seen to lead to more investments towards usability factors. In addition, UX was

seen to be guiding the way all the time during development. As a result, user experience was said to be one of the key factors that the company wanted to utilize to stand out for the competition.

As opposed to the project-centric vision of Fastems, UX at KONE Oyj has a substantially larger meaning, showing all the way up in the strategic vision of the company: "KONE's vision is to create the best People Flow™ experience. Our strategy is to deliver a performance edge to our customers by creating the best user experience with innovative People Flow™ solutions". Hence, UX has been implemented to the organizational structure in the form of a Customer Experience unit. (KONE, 2012a). According to the employee opinions, this has a crucial meaning in their recent programs. Providing the best user experience with innovative solutions is seen to be one of the four main goals of the development projects, affecting both the nature of the single solutions and the direction of whole development programs. The vision has been communicated throughout the organization all the way up to the CEO, respectively. Likewise in Fastems, UX is said to be one of the factors that the company strives for to achieve competitive advantage.

Compared to Fastems, the role of UX is much more visible in the organizational structure and strategic vision in KONE. Consequently, it can be argued that user experience and customer experience has a somewhat larger and more strategic position in KONE compared to Fastems, it being implemented more into the processes and culture of the company instead of individual projects. One explanation for this difference could derive from the industrial context of the firms. Fastems operates on an engineering-led industry where the key competitive factors of the systems are typically bound to functional and technical aspects. The user goals of flexible manufacturing systems and robotics are similarly aiming for cost-efficiency and precision. In contrast with this, the use of an elevator and escalator - besides the pragmatic goal of moving from place one place to another - often includes many experiential aspects, which in turn affects the brand image of the customer company.

The user goals for the system are relational to the purchasing decision criteria for the product. The main goal of Fastems's system is to improve its customers' competitiveness through automation and unmanned production technologies (Fastems, 2012). The systems are typically positioned in the manufacturing operations of their customers and thus do not have a visible impact to the brand image of the customer companies. The experiential factors in factory automation may be considered merely in the way that workers can learn how to use the system effectively. Thus, the hedonic needs of the workers do not typically have such a big impact to the purchasing decision of the system. As opposed to this, the products of KONE – besides the logistics function – are typically a visible part of the whole building or construction, making them more

integrated in the whole offering of the customer company. Moreover, the hedonic values of the end users of the KONE's products are typically more considered when making the purchasing decision of their product.

The competitive environment of the case companies could also explain part of the difference. Based on the statement of Fastems's employee, a typical FMS producer is selling with the technical specifications and quality of the system. Quality means how well the system is able to meet the technical requirements of the production line. Compared to this, the rival manufacturers of KONE also use experiences as a selling argument for their product (e.g. Schindler Ltd, 2012). Besides elevator and escalator manufacturers, the market includes also firms that offer comprehensive services for the interior design of buildings and can therefore diminish the role of KONE in the building or renovating process. However, as stated by the employee of Fastems, the importance of technical specifications is diminishing, and the key competitive factors are moving towards better software, services and better usability.

The differing case contexts should be noted when comparing the case situations to each other. Furthermore, the perceived differences should be noted when drawing the conclusions on the CSFs of UX related project management. A comparison with two slightly different development programs enables us to view how the nature of the development program reflects to the perceived success factors. Furthermore, focusing on one specific development project in one case and giving a more general view of the development projects in another case will both give a user centric case example. It also provides a broader picture of the success factors that have been found to work in that industrial context. On that account, comparing two different case contexts with the same theoretical framework will give a more general view of how the theoretical findings for UX related success factors can be adapted to the complex system environment.

4 RESULTS

"The second act is called "The Turn". The magician takes the ordinary something and makes it do something extraordinary."

The following case narratives withhold case-dependent answers to the research question and the research objectives: 1) what effects does user experience have to the management practices in the context of complex system, 2) how do the intended user experience based strategic decisions impact the transformation of development processes, and 3) how do the desired results affect the perceived value in the sales and purchasing process of the system. The narratives give an insight to some managerial perspectives of UX related development projects in industrial complex systems context which has not yet been thoroughly investigated in academic literature.

The results are gathered from the interview findings. Besides the narrative form, some straight quotations are presented to bring more variety to the text and to highlight the subjectivity of some topics. The quotations are indicated with an italicized text form and quotation marks. To enable a better discourse, the quotation are marked whether they were said by persons from R&D-department (R&D), sales and marketing department or customer segment management (S&M), the steering group or senior/division management (SG) or a customer company representative (CC).

After the narratives the main research question is discussed together with the main results of each narrative. After that the influence of the conducted research to the theoretical framework and studied phenomenon is discussed.

4.1 Project narratives

4.1.1 Fastems Oy Ab – The development of a FMS control system

MMS5 (Manufacturing Management System) was designed as an update for the flexible manufacturing system control software that Fastems Oy Ab produces. There were many ground reasons that led to the development of MMS5. One of the principal reasons was the need for a technical renewal for the previous versions of their FMS control systems. The old control software was getting too old for efficient use and support for the R&D tools used in the previous versions (MMS2, MMS3, MMS4) system was not guaranteed anymore in the future.

> *R&D: "The technical base for MMS4 was about to get too old. The tools used in the system, which were provided by Microsoft, were supported but were not developed anymore."*

Besides the technical reasons, the visual appearance of the old control software did not anymore appeal to the customers. This affected the attitude of internal sales and marketing people towards the system. The new system was aimed to look good and provide better user experience to the customers. Better user experience was targeted by aiming at control software that was easy to use and modifiable according to customer needs. Aspects that were aimed to bring with the new software were related to forecasting the production and its resources. UX was targeted as the factor that would separate Fastems from its competitors. According to a customer representative, the software abilities such as scheduling were one of the reasons that led to the buying decision for MMS5.

> *CC: "We didn't look at the price. Because, I wanted some features in it. I want to schedule, I want to do this, I want to do that. And the other companies didn't have that."*

MMS5 was designed for three different user groups. The user interface mainly for the factory workers, called MMS Station Commander, is used for operating the machine. The MMS Data Manager is meant for the factory supervisors, responsible for production planning and detailed scheduling of the production. The Data Manager enables the user to control and plan the allocated resources and schedules for the production line. The third user interface, MMS Dashboard, was developed mainly for the needs of the production managers and other managers. It provides reports on the status of production activity and production costs at both current state and longer time-periods. In addition, the system can be used by NC-programmers and the people of Fastems Teleservice. Teleservice is used to provide customer care after the product delivery.

The sales of the system are handled mainly by the salespersons of Fastems. At some point the people from R&D divisions are also involved in presenting the system. From the customer's side, the owner and/or CEO of the customer company is typically involved in the buying process together with some people from the R&D and the manufacturing department. According to the sales manager of Fastems, the discussions usually begin with the production and the R&D managers of the customer company, occasionally with a few system users involved. The end discussions usually include some persons from the senior management level of the customer company. In addition, the sales process always includes some visits to a reference customer to see the system in action.

The development of the FMS control software MMS5 was divided between the actual project team and the steering group. The steering group involved executive people from marketing, sales, after-sales, maintenance and R&D. Every major decision regarding the development process and the developed system itself was made within the steering group. The execution of the tasks was operationalized by the project team, consisting of five software engineers, the project manager and the "architect" that acted as an advisor for the development process. In addition, the user interface design and coding was made together with external parties.

Based on the development team's point of view, the development project was having clear targets for utilizing UX in improving the final product. As an example, touch screen module software was elected partly due to believe that it would lead to a better user experience for the final system. However, according to an opinion from the steering group, the goals were merely separate thoughts and the development process lacked a clear vision of the product aspect design. According to Jain et al. (2011), a shared vision would be needed in order to use UX as a strategic factor. Furthermore, when interviewing the salespersons about the current competitive factors of Fastems, they placed a higher emphasis on traditional values such as product quality and automation integration skills, thus mentioning that UX could be one of the key competitive factors in the future.

> *R&D: "We wanted to put really an effort to the visual appearance of the system. In addition, we wanted to enhance user experience and ease-of-use of the system."*

> *SG: "We could have been more aware of what is supposed to be in the product, of course there were things like reporting, statistics and so on which were mentioned during the development, but it cannot be said that we owned a clear vision."*

The growing demand for product usability by the customers was noted by the sales division. According to the sales manager, factors such as perceived ease-of-use, ergonomics and safety are becoming more and more important among the customers. Respectively, a customer representative stated that the technical features and functionality are still the main things that are considered when making the purchasing decision for a new FMS system. However, trust towards the supplier, usability warranties and the kind of after-sales services that the supplier is offering were mentioned as one of the three main pillars that were evaluated when making the purchasing decision. Thus, the customers of Fastems seem to place a higher value on the service and brand aspects instead of product usability functions as such. This implies a need for the suppliers to aim at providing a more holistic UX experience to the customer, widening the offer beyond the initial product order.

> *CC: "A purchasing decision has typically three different aspects involved. One of them is linked to technical requirements of the actual system… The second is about commercial aspects, including the prices, lead times and warranties of the system. The last but definitely not least are aspects that are linked to services and after-sales."*

Furthermore, the customer representative mentioned that the user usually prefer products that are easier to use compared to the one with more functions. Additionally, experience with earlier similar systems will enhance the understanding of new systems as well. This implies a need for development project managers to extend their scope beyond improving usability functions to consider the earlier system experiences of the customer when aiming to provide good user experience.

> *CC: "Whether it is about any system whatsoever, the one that you already have experience in will feel easy to use… Easily the people will vote that yeah this is good."*

Members from the steering group were involved in most of the major decisions regarding the development. In addition, the project manager of MMS5 had a lot of influence to the decisions. He reported about the current situation and planned actions to the steering group and acted as the integrator between the steering group and the development team. Different ideas were analyzed in various stages of the development together with the development team and the steering group every 2-3 months. Likewise the findings of Hecker and Berger (2011), these kinds of monitoring actions are seen to help keeping the development running and more customer-oriented. Hence, the calls were usually made as the result of a consensus.

> *R&D: "Many of the decisions were made by the project manager in order to keep a constant flow of development. The ideas are pondered together with the team. The option that feels good collectively is usually chosen."*

> *R&D: "Every idea went through certain gates where the process was analyzed whether the idea was either passed or rejected. The risks and cost calculations went through several task forces."*

The cooperation between the steering group and the project team lead to many decisions which improved the aspects of the developed system. Additionally, it was seen to affect positively to the attitudes of sales and marketing towards the new system. However, the benefit of cooperation between R&D and sales force was argued to work merely on improving the people's general attitude about the system, leaving the concrete changes in the sales processes smaller.

The project manager and the whole development team of MMS5 had done similar projects on control software also before the MMS5. According to the opinion of the project manager and the steering group, the development team was perceived to be as good as possible to transform such project. Partly learning from the feedback from previous software projects, the importance of developing modern software had been noticed also in the senior level of the company. Similarly to the findings of Hecker and Berger (2011), the support of senior management was seen to assist highlighting the role of user experience in the development. Partly thanks to this, the resources given to the usability and user experience was considered more than sufficient.

> *SG: "With MMS5, the sales and even the senior management seem to have noticed that making good software is smart… This is important and it needs to be improved."*

User experience and ease-of-use was used as the guiding point of the whole development process of MMS5, concretized in the form of a "15 minute story". Moreover, the development was checked whether it went according to the 15 minutes story. Keeping a solid guideline was seen helpful in achieving the usability goals in the transformation of the project. Moreover, the salespersons responded that they can now better explain the main features of MMS5 to the customer.

> *R&D: "A person should be able to explain the main points of the software in 15 minutes to the listener so that he or she understands what the system is about. A developer has 15 minutes time to explain the main things to a salesperson. Furthermore, the salesperson has 15 minutes time to explain the story to the customer."*

The external party responsible for creating the user interface for the system was given fairly open hands when developing the early prototypes. Authorizing UX experts is seen as a good approach in such development programs (Hellman & Rönkkö, 2008). The project team of Fastems was later on closely involved in the user interface development to ensure that the right functions are implemented and that the functions suit to the use context of the system.

> *R&D: "The design of user interface was done with a close collaboration of our development team and the external party. The first prototypes for the user interface were intentionally designed from scratch to give a fresh perspective. These were later on modified to suit better to the use context."*

A cross-functional approach was said to be used in the transformation process of MMS5. Furthermore, the steering group withheld people from all different divisions. According to Rosenbaum et al. (2000) this approach enhances the likability to develop a

system that responds better to the customer needs. In the case of Fastems, it was seen to affect positively to the attitude of person in senior management, sales and marketing towards the development of MMS5. People that had previous experiences from different customer projects were intentionally brought upon the development team. However, outside the development team the role of marketing and sales in the actual development process was not remarkable. The salespersons admitted that they do not have the competence to make any decisions about the software but their involvement could have conveyed the customer needs better to the development process. However, a member of the development team said that any concrete development solutions were difficult to establish due to the unclear answers of the salespersons. The situation proves the classical dilemma of the communication and cooperation challenges between R&D and sales divisions in an organization.

> *R&D: "We purposefully had people in the development team involved who had been closely involved in earlier customer projects. This helped to bring the customer needs to the development team."*

> *S&M: "If we would have been more involved, maybe the customer needs and desires could have been better transmitted to the organization."*

> *R&D: "If we ask whether we should do this or this, they (persons from sales and marketing) say that we should do both. The situation always is that you cannot get a clear answer to anything from them, in which cases the decisions have to be made usually, if not always within the development team."*

Differing from the recommendations of Jain et al. (2011) and Rosenberg and Kumar (2011), direct contact with customers was not held during the development process. This was reasoned by the project manager who stated that customers usually are not able to describe accurately their needs for the software references. Instead, the company had acquired a large amount of customer information during their customer interactions and previous development projects. Some opinions stated that more customer-research could have been conducted more thoroughly. Moreover, according to one manager's point of view, the gathered customer information was not reported and analyzed deeply enough.

> *R&D: "The different needs were derived from the information that we have from experience, old customers and the way that the customers are interacting with the machines."*

> *R&D: "Customer and end users do not necessarily see the work at a sufficient level. The answers and comments are these kinds of single details."*

R&D "We could have had more these some kind of customer studies to define the big lines for the functioning of the control system. We have concrete information about the customer needs, but I do not see that they were of any benefit to us."

SG: "We have been always pretty weak in reporting information. We have everything in our database, but our software people are too engineering-minded to be willing to utilize this information to improve the user experience of the factory worker."

The recent trend of Fastems to expand to global markets was shown in the development process. The development team of Fastems took the different needs of the user group into account by designing an own interface for each user group. Each interface was provided only with the functions that were seen important for them. In Finland and in the Northern countries the operators of the system have typically a lot more power and possibilities in the development process than the operators in other countries. The challenge of differing customer needs was aimed to respond by making the different user interfaces modifiable for the needs of each customer. Such actions to support user tasks are found to help delivering a product that the users really want (Sobiesiak et al., 2002; Hecker & Berger, 2011).

However, a purchasing representative in a customer company mentioned that many factory automation systems often include too many different options, making them difficult to use. Sometimes this has ended up in a situation that the users actually want to choose from various options a system that has fewer attributes and thus is easier to use. Furthermore, previous experience of similar systems was seen to affect to the perceived usability of the system. This finding implies that the product development management should not only be considering including the different variations, but aiming to provide a system that would present the functions in such a way which is similar to the older system.

On communicational matters, the development of MMS5 was described as an open process internally and externally. A person from sales division said that they were questioned and interviewed about customer needs and sales support material among other things. According to the project manager and steering group, these sessions raised the awareness and attitude of both internal divisions and customers towards the development. Furthermore, a continuous dialogue was said to lead to a fewer amount of complaints about the system. Similar findings have been found also by Venturi et al. (2006). Information exchange between the steering group and the project team was found sufficient and helpful during the project, helping to overcome the multiple challenges faced in the development of the control module.

> *R&D: "Before anything was ready we showed some pictures of the user interface to salespersons. They were anxious to know when they can get the system. Information was given also outside the building to magazines; we spread it in purpose to get customers interested to ask when they can get the system."*

There were different opinions regarding the sufficiency of communication between R&D and sales divisions. Others stated that important customer information was coming from the salespersons. However, others saw that much of the issues brought up by the salespersons were not understood properly in R&D which resulted in that many decisions for product functions were made inside the R&D department. Furthermore, many responded that more people from after-sales department should have been involved in the decisions and information exchange regarding product design. When asking the buyers within the customer company about the product features, they were not fully aware about the characteristics of the product in different user levels. Furthermore, the service persons that were delivering and training the system to one of the system's first bigger installation did not have full knowledge regarding the system. Examples like this may prove that the communication from the R&D department to the sales process is still lacking.

> *SG: "We know that our problem is our collaboration with sales and marketing, and it has been tried to improve. In the early phases of development we had these kinds of meetings, but after the launching of the project there had not been any."*

> *R&D: "The members of after-sales could have been more involved. They have their hands full from their own workload which kind of prevented them to attend the development projects too much."*

> *CC: "...the guys who service and install, and train us, didn't know anything about MMS5… One guy of R&D was coming after two and a half months. Then they really found that they had a problem up here."*

An UX oriented mindset was seen to exist among the project development team and the steering group. However, the interviews revealed some interesting facts regarding the opinions about the project's influences to the organization on a longer time-scale. According to the project manager, highlighting UX in this project is reflecting the general direction of a user centric mindset. Contrary to this, a senior member of the steering group mentioned that putting a lot of effort to UX was more just a project-specific thing. Based on the answers from the interviews, the persons involved in the development team clearly think of UX as a key competitive factor already in the current operation, whereas the managers and salespersons perceive it more as just one design

aspect among others that will likely have bigger effect in the future. This twist in the answers implies that joint collaboration on UX matters is still lacking a clear internal coherence. According to Sobiesak et al. (2002), an organization-wide UCD mentality is required to include UX as one of the key competitive factors of the company.

> *R&D: "In the background there was information that this would be our control platform also to other software… We are also starting to utilize it in the robotics area."*

> *SG: "It (UX) was more a project-specific thing… It would have been great if it would grow as an organization-wide phenomenon, but now we concentrated on this specific (MMS5) project."*

The company's employees thought that sufficient amount of resources were put on developing UX matters. However, the respondents said that the resources given to sales and marketing divisions towards such development projects were too scarce. This has affected the development process so that the development team has done some of the work originally belonging to the marketing division. In addition, any direct user or customer testing of the control software was not made due to the lack of time and resources in the development process. Instead, software testing was made internally within the company divisions.

During the testing, aspects that were enhancing the system's usability and UX were seen helpful in lobbing the development process further. Making good-looking prototypes and real-life picture of the software system at an early phase of the development helped to get people interested towards the project.

> *R&D: "It helped a lot to make the things visual. If you have a project plan, nobody will get interested. We made with our external party a visual user interface of the control software… we showed it to everyone to see that "this is how our new software looks like". It worked like a dream."*

> *S&M: "Nothing else has raised such interest among us than now this MMS5 control module… the visual appearance was so much better than earlier, and it made us think that we need to get this fast."*

When asking the employees of Fastems about how successful they perceived the project, most of them gave positive answers. Especially the members of the development team highlighted the big leap that was made to the FMS control systems with MMS5. In the sales division employees emphasized more about being able to sell a product that can be adapted to the different needs of the customers and how its operational principles are guaranteed to be used for at least the upcoming decade. Compared to previous R&D projects, fewer complaints about the system were noted in

R&D and the steering group. This was reasoned for example with good leadership skills.

> *R&D: "I (project manager) am pretty proud of the product… It can help the customer to forecast its production so that the products get ready on schedule… The touch screen brings ease-of-use to the system."*
>
> *S&M: "The external features are much better than in the previous control software. It creates an image that I need to have this… The forecasting attributes makes it a straight answer to the needs of especially Finnish MEI companies… MMS5 is a product that it easy to sell."*

The usability features were also mentioned as product benefits, but their role in the selling arguments was not seen significant. They were justified by saying that the customers always want the newest software, regardless of its usability functions. On the customer side the people responsible for the purchasing decisions valued most the after-sales services and brand image on the experiential factors of Fastems. These findings about the holistic point of view UX are supported by Venturi et al. (2006, p. 221), resulting that the strategic value of UX does not lie in in a single method but in the interplay between organizational factors and the usability methodologies chosen.

4.1.2 KONE Oyj – Providing People Flow™ experience

The case narrative of KONE is focused on presenting results from multiple UX related development projects. Thus, the idea is to frame a general picture of how the development projects are managed and controlled and what has been the effectiveness of project management decisions and actions. The interview results from sales division and from a customer's representative will give a more valid picture of the management actions effects in the sales and purchasing process. Most of the interviewees (four out of six) were related more to the development side, which might have led to some distortions in the answers. Moreover, since all the interviews were made from the supplier's point of view, any conclusive results regarding the system's effects in the perceived value of the system or to customers' behavior cannot be drawn. Due to the fact that the results are drawn from multiple projects, findings on any project-specific perceived success are not presented. On contrary, the goal is to make a more general representation of the project management success factors.

User experience is shown in both the vision of KONE and in the form of an organizational unit called Customer Experience (KONE, 2012a). A high level of customer-centeredness is aimed with a segmented approach where each segment is responsible for a certain customer group. Additionally, a segmented approach is used to communicate and deliver user needs throughout the value chain of the company. A

segment manager and a marketing manager see this approach as a practical way to provide solutions that better respond to the needs of each specific customer group.

According to a project manager, the company level vision "People Flow™" is shown also in the concrete aims of the development programs. This argument is supported by the fact that UX is placed as one of the criteria against which the project's performance is reviewed. The results of the reviews in each milestone affect further steps of the project. These kinds of actions are seen to help integrating UCD practices to the development programs (Venturi et al., 2006).

> *R&D: "The best user experience is one of the four main goals in our development projects. And how it shows in our work is by the evolution and change to a more customer value based development programs."*

Interviews with frontline managers reveal that the UX related concepts developed by the R&D department have been emphasized also in the sales process of the products. The results on the differing end-customer segment preferences are delivered to the customer company by giving consultancy on how interior design could be designed better for the needs of the end users. However, according to a segment manager's point of view, too little information about the results made on internal UX studies is delivered to the customer.

> *S&M: "We have often expressed our ideas to construction firms when they design homes for example to elderly people. It has not been narrowed to only our offering, but taken into account in a larger scale instead."*

> *S&M: "We do an awful lot of things, but we do not tell this to our customer. We do this and that and we have thought that it would benefit you, but we do not tell that to you."*

KONE Oyj has divided its development programs into different teams. Every program has a project development team and a steering group that controls the development. The projects that are more focused to the elevator or escalator itself include a lot of mechanical designers who are thinking what forces are linked to moving the cage or lift, what kind of hoist ropes and electronic motor are needed and so on. The more UX related development programs are typically made by the team Access Control and Integrated Solutions (ACIS). This team works on everything else than the hardware product, aiming to provide value-adding services and extra dimensions to the basic offering. Linking the use of a mobile phone to the use of an elevator is an exemplary project of the team.

> *R&D: "Things that our (UX oriented) team does are not only related to things that are happening in the elevator shaft. Instead, we look at the apartment from the front door to the elevator, and hopefully back to the front door."*

As said by a project manager and a UX-specialist, the needs and points of view of the end user are more strongly involved in UX related projects than in the more mechanic-oriented development projects. One reason for the distinction was stated to result from a different mindset between UX oriented features and traditional elevator and escalator projects as described in the paraphrase above. A broader view of the context was seen to lead to many new technologies that are not linked to elevator technique. Furthermore, this was said to continuously create many discussions about what is the final experience like and how could UX be defined in this context.

A need to extend the focus besides the technical functions has been pointed out also by a frontline manager. Sales arguments such as security and automatic doors cannot be used as a competitive factor anymore since all the competitors are offering the same functions. The added value was said to be accomplished by the right way of bringing the benefits forward to the customer. In addition, the sales process and value argumentation need to be adapted to different geographic locations.

> *SG: "The sales process and argumentation are completely different… In the Finnish advertisements the highlight is on bringing the best eco-efficiency. In certain other countries the eco-efficiency has not found its place… more is based on financial numbers."*

A project manager presented a representational graph of a typical project progression at KONE (Figure 12). The development project is divided into three distinctive steps: investigation, conceptualization and product development. According to him, the investigation step withholds a lot of joint collaboration and exchange of ideas with universities, patenting different ideas and so on. The conceptualization phase is about starting to frame the ideas into different design concepts, whereas the actual product development materializes the ideas into concrete offerings.

In the investigation phase, the risk level is said to be higher than average, including both technological risks and market-based risks according to the project manager. Once the project is developed to the conceptualization stage, a project team is typically established and more resources are invested in the specific project. Consequently, the risks that might affect the outcome of the project or the development process itself are aimed to be lowered. The conceptualization aims to build a lot of prototypes and therefore already get some insight of how the solution might work in its final form. Once the project continues to product development phase, the development team should be more certain that the solution can be brought into commercial production. The

product specifications do not need to be touched anymore since all errors and bigger modifications in this phase create a lot of pressure of time and cost to the development process.

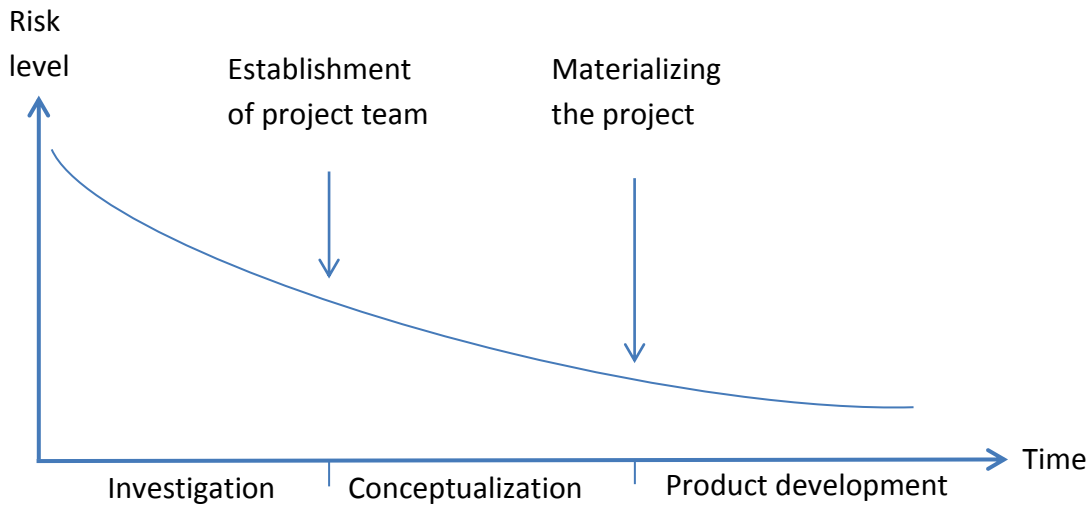

Figure 12. Progression of a development project (based on an interview)

The needs of the target groups are emphasized during the investigation phase. This goes along with the recommendations of Jain et al. (2011) of a target-group oriented strategy. The team follows certain technologies and think, whether they could help the customer or end user and therefore be useful also to KONE. The other link for finding new ideas and signals is perceived to come from feedback and observation from the market situation, external partners and customer companies. A major part of communication is stated to extend only until the customer company which can end up in possible biases regarding the needs for the proposed solution. Furthermore, the customers are argued to be very silent about their end user portfolio. According to the business division manager, too little monitoring is made towards the end users in business segments, where there is no direct contact to end user representatives. It is seen as a subject that needs to be developed towards more collaboration.

Differing from this opinion, a project manager of the ACIS team mentioned that their monitoring involves quite a lot of end user testing especially in the project conceptualization phase. This difference might be a consequence of the fact that business division manager is talking about the equipment development business in general whereas the project manager is more concentrated on the development of specific UX oriented features. Furthermore, an UX-specialist mentioned that fast and simultaneous feedback is coming but that it could be collected more systematically. However, it was added that getting pieces of information from for example service persons would be challenging due to the large number of service personnel worldwide.

> *R&D: "We (ACIS team) use end user testing especially in the planning phase of the project since in the latter phases it is too late to make any changes to the product specifications."*

> *SG: "Too little user enquiries are done at the moment within new equipment business. We are more active in the modernization and renovation business where we make the deal directly with the housing companies."*

Once the development continues to the conceptualization phase, a project team is typically established and the idea is starting to be framed into a concrete solution. The conceptualization phase involves a lot of evaluation processes, where the ideas are assessed using various requirement criteria. As stated by a project manager, UX is considered as one of the criteria with which meaningfulness and sensibility of the concept is assessed. The experience of different solution options is evaluated, after which the decision is made about the chosen solution. According to a UX specialist, further usability testing is done towards the end of the development process. Besides the more creative UX concepts, accessibility and usability for different user groups is always one issue that has to be taken into account.

> *R&D: "It is pretty accurately defined in the coding system that there has to be adequate usability also for the more challenging user groups."*

> *R&D: "There exist a lot of different types of users such as residents, visitors, repairmen, cleaners, authorities and so on… We need to find out what each user group wants… The needs and requirements of each user group and use context separate surprisingly much."*

During the project conceptualization there is a dialog between the steering group and the project development team about which directions the ideas are taken into and what the final proposal for the development project is going to be like. The project manager is responsible for proposing the project to the steering group. After some discussions, the steering group makes the final decision regarding the materialization of the project.

If the project is accepted, the project evolves to the product development phase. The development team has the responsibility to carry out the project, during which there are typically still five milestones, at which the steering group needs to monitor and to approve the development process. Furthermore, the budget matters can be monitored with an internal software tool. As stated by Hellman and Rönkkö (2008), continuous monitoring approach like this will lead to a more efficient UX development cycle.

When asked about the difference regarding leadership ways in UX related project compared to traditional projects, the project manager responded that the fundamental leadership principles do not differ a lot between different project types. One aspect that

was emphasized by one manager was concreteness which was seen to help visualizing UX. Usability and UX as such are not concrete things. Creating something concrete, such as a drawn picture or a sketchy prototype was seen to help getting much better conversations about the subject. Furthermore, even better is if the proposal can be drawn into a real-life elevator context. The same idea for providing concrete material for the frontline persons was seen effective for delivering the UX oriented visions towards the customer.

> *R&D: "If the idea can be concretized in some way, it enables to see it yourself that "okay, this is how it works". This helps also in putting together the user experience."*

> *S&M: "We are making concrete changes to the sale brochures and presentations to include UX as one criterion. This way the frontline persons are obliged to think of UX as one of the selling criteria of the product."*

Each development project is given a certain budget according to the project needs. The project manager evaluates personnel, material and outsourcing needs and combines them on an annual basis. They are evaluated in the senior management, after which the teams are supplied with suitable amount of resources. These include providing the project with suitable persons for a certain amount of hours, thus being involved usually until the end of the project.

The user experience team with UX specialists is allocated with their own budget, which they use to provide help to the development projects. Including UX specialists in the development team is seen important also in literature, ensuring that UX will make a higher impact to the development program (Vredenburg et al., 2002; Hellman & Rönkkö, 2008). Due to the limited amount of in-house specialists, they are typically aimed to be involved in planning the UX abilities and more external parties are involved in pure user testing operations. According to a project manager, this has been found the right way to do since UX planning requires lots of previous knowledge from the industry segment and usability testing can be done more easily.

The project development team is controlled by the project manager and the lead designer after the beginning of the project conceptualization phase when the project team is established. These two persons are handling most of the communication with other departments and teams within the firm and additionally towards the steering group. Furthermore, every project has a virtual workplace where any piece of information can be uploaded, shared or viewed. This can be used by KONE employees as well as external parties, depending on the case. In addition, there is a specific internal tool to share and view the budget of the project. Regarding more personal communication, videoconferences, teleconferences, weekly or period-based meetings

and other live meetings are held with the partners and the steering group. Such strong communication infrastructure is seen to improve the probability that UX teams are aware of each other's work (Jain et al., 2011). In the case of KONE it has been found that communicating test results and reports from analyses has been found one of the most efficient ways to make an impact with the UX-linked solution in the development projects. In addition, producing a concrete idea such as a prototype of the developed idea is seen efficient by a project manager to develop an idea further.

> *R&D: "Especially in the conceptualization stage, where the outcome of the development is uncertain, having some kind of physical prototype is pretty efficient."*

Actual salespersons are less incorporated in the development process. According to the interviews, most of the communication is made with sales managers. They update a list for the top aspects that are missing from the product or reasons why the sale was not made. This is presented to the product development team managers. Additionally, some feedback is coming from salespersons in the field and from informal discussions during the development process. However, most sales and customer feedback on the actual developed solution are coming mainly after the product is launched. It was mentioned in an interview that more feedback from the salespersons and customers could be beneficial during the actual development process. A project manager stated that making any improvements from one salesperson's point of view is challenging since usually the opinion is derived just from a certain sales situation and does not necessarily provide a general solution for the time that the product will be launched.

Differing from literature findings (e.g. Frow & Payne, 2007; Hecker & Berger, 2011), small amount of concrete improvements have been achieved with customer discussions. However, the development of marketing material and the right selling arguments were perceived to be the most effective with some customers involved in the development process. These findings imply that customer involvement is less useful to the development process itself, but provide valuable results in the development of more customer related material.

> *R&D: "Some feedback could be received from the sales-customer surface. This would at least improve faith that we are doing right things."*

> *S&M: "We have a few forerunner customers that think of themes like customer journey… this creates good discussions but anything concrete seldom comes out of it. The maturity of our customer companies on this matter is maybe slightly lower than ours."*

> *S&M: "The discussions that have included also some customers besides the internal development team have led to the best end results in the development of marketing material towards customers' needs."*

Supporting the idea of providing more market and customer information, a frontline manager pointed out that the development team rarely knows what the market prices for a product are and what the acceptable cost structure for the solution could be.

> *S&M: "Feedback discussions should be started to find out how we could improve our product architecture so that it would correspond to the market that is willing to pay for it."*

The aspects above mainly describe the communication flow towards the development team. On communication in general, the UX related vision of People Flow™ is communicated all the way up from the CEO of the company throughout the whole organization. The frontline managers have internalized this idea by changing their mindset towards more customer value thinking. The interviewees see that such communication has helped to deliver the message that this vision is not only limited to the details of the products but rather a way that the company can differentiate themselves. Similar findings have been made also in literature (e.g. Sobiesak et al., 2002).

However, as mentioned by the project manager of UX related development projects, including UX vision to the delivered value to the customer can be challenging in products that are more simple and straightforward. Furthermore, a marketing manager stated that the most challenging issue is to deliver the customer value message according to the customer needs. Some customer companies are more valuing UX aspects whereas the others give a bigger emphasis to more technical features.

> *S&M: "We have to be really careful not to overrate the amount of UX arguments that we want to bring with the product. Sometimes we try to emphasize the user-centric aspects and forget about our core competences in the technical aspects of the product. In some sales situations this has created a negative effect."*

Regarding communication flow from R&D towards the customer, there are differing opinions whether enough information about the product and user needs are delivered to the customer. Opinions that are closer to the development process itself imply that an efficient way of communicating the value of UX towards the customer is still lacking. As opposed to this, a division manager sees that user needs are being taken into account also in the sales argumentation of the products. Moreover, it was perceived that a

significant challenge is in the productization of UX so that instead of giving free consultancy to the customers, some benefits UX could be also drawn to KONE as well.

> *S&M: "We have a situation that we give a substantial amount of free consultancy… This question is continuously on discussion but there ought to be a ready solution for it. The consultancy is not yet productized as good as we would like it to be."*

Based on the interview results, the concept of UX can be considered a company-wide phenomenon at KONE Oyj. It is seen as a guiding aspect for product development processes and been taken into account as well in the sales processes and sales arguments of the products. However, many opinions state that efficient collaboration with the sales-customer surface and end users is still lacking. Moreover, a business division manager mentioned that there is still a lot room for improvement in the productization of UX. According to him, at the moment most of the abilities are only meant to help the customers and less meant for monetary benefit for KONE. Furthermore, a marketing manager highlighted that it is important to adjust the selling arguments for the product according to the customer values.

4.2 Synthesis of the case results

Demonstrating a theoretical contribution is seen as a central challenge in case study research. Drawing upon theory is crucial in the end of the research process where the main results are distinguished to extant theory and the main contribution of the findings is expressed. (Ridder et al., 2012, p. 1.) The expressed case narratives provide some real life examples of how user-centric development project are managed in practice in CoPS environment. The results of this study support the arguments made by earlier studies about the growing importance of UX and usability within complex systems (e.g. Flowers, 2004; Hobday et al., 2005; Baraldi, 2010; Hecker & Berger, 2011). The results imply that user experience can be used as the base for competitive advantage. Furthermore, user experience was seen to also affect the perceived value of the product during the sales and purchasing process of the system.

The results are expressed so that they can be evaluated against the literature-based success factors for user-centric projects (Table 16). The two most left columns describe the different dimensions and the according CSF. The correspondence of each case for the specific factor is evaluated in the second column, indicated as "Good", "Intermediate" or "Poor". The justification section explains how the effectiveness for each factor was perceived or implemented in each case. The parts that the case results were not seen to bring an answer to are left empty. A success factor that was found to exist in the cases but has not been pointed out in earlier literature is marked with a dashed line.

Table 16. An evaluation of the case results in relation to the success factors in UX environment.

Project attribute	Critical factor	Case Fastems		Case KONE	
		Taken account of	Justification	Taken account of	Justification
Goals and objectives	Strong business case/sound basis for project	Good	Technical, visual and attitude reasons led to the development of MMS5	Good	The "People Flow" vision is shown in the concrete aims of the development programs
	Target-group oriented strategy	Good	The module was designed for three distinctive user groups according to earlier customer projects	Good	A segmented approach is used in to focus in the needs of each customer segment
	Clear realistic objectives	Good	Even though the initial UX goals were too far off, they were clarified later on	Good	The best user experience is one of the four main goals in our development projects
	Providing usability goals and providing incentives	Good	The 15 minute rule guided the process and enhanced the understanding of salespersons to sell the product	Good	UX is placed as one of the criteria against which the project's performance is reviewed and modified
Performance monitoring	Validation of customer behaviour / feedback / requirements	Moderate	Validation derived from previous project experiences. Lacking communication towards salespersons and customers	Good	Lists for issues to be developed are collected from frontline persons. These are utilized when planning new development projects
	Effective monitoring/control	Good	Monitoring sessions between development and steering group every 2-3months	Good	Internal evaluation of UX aspects in done in every phase of development
	Competitive analysis/review sessions	Good	Review sessions between the development team and the steering group	Good	Review and evaluation sessions between development and the steering group
	Adequate UX measurement tools	Moderate	Usability testing. No extensive monitoring for UX practiced	Good	Usability testing. UX is measured of its concrete benefits to the company in research and conceptualization phase.
Decisions-maker(s)	Executive/founder/management support	Good	Software and UX is perceived important also at top management level	Good	A separate CX division is established. UX is communicated from the senior management level
	Good leadership	Good	Better recognition for MMS5 was justified with good leadership	N/A	N/A
	Competent project manager	Good	Was perceived as good as possible	N/A	N/A
	Authority to UX expertise	Good	External UX partner was given a lot of liberty to design the user interface	Good	Internal UX team is established which is used to help planning the UX aspects of the product accordingly
Transformations	Cross-functional research/design approach	Good	Development team and steering group withheld people from all divisions.	Good	People from sales division and CX-division are incorporated in the development projects.
	Skilled/motivated staff/team	Good	The development team was chosen from people that had previous experiences from similar projects	N/A	N/A

	Focus on supporting user tasks	Good	Modifiable user interfaces were developed for different user groups	Good	Adequate usability for all user groups are defined in the coding system.
	Providing prototypes/ concrete examples	N/A	Prototypes and concrete examples enhanced the motivation and development of different ideas	N/A	Concrete examples / drafts /prototypes are seen to make it easier to evaluate the UX aspects of the product
Communication	Internal/external communication of design methods	Moderate	Collaboration was lacking between R&D and S&M. Customers weren't fully aware of all product aspects	Moderate	Internal communication of test results and reports for UX creates positive impact. External design consultancy is done too little.
	Close customer relationship	Moderate	Direct customer contacts weren't used in the design process. In general the customer relationships are close in FMS industry	Good	Sales and after-sales are in contact the customer. Some forerunner customers work closely with KONE in the sales and development processes
	Good communication	Moderate	Open development process internally. Lacking communication with after-sales and customers	Moderate	Most S&M feedback is coming after the product is launched. Major part of communication extends only until the customer
Environment	Past experience (learning from)	Good	Customer information and information from earlier systems were utilized in the development process	Good	New ideas and signals are coming from feedback and observation from earlier projects and external parties
	UX oriented culture/mentality	Moderate	User-centric thinking narrowed to the single project with some persons	Good	The development team thinks of the whole building flow instead of technical functions
	Organizational adaptation for UCD	Moderate	The actions considered merely single decisions (e.g. 15 min rule / touch screen)	Good	An own division for CX established. UX one of the main pillars of development
Boundaries	Proj. size /no. of people involved/duration	N/A	N/A	N/A	N/A
Resources	Sufficient/well allocated resources	Moderate	Sufficient resources were given to the development team. S&M had lacking resources for participating	Good	Adequate resources are given to the development programs according to the project needs.
	Systematic/appropriate training and meetings	Good	Systematic meetings between development team and steering group	Good	The development programs include meetings with UX specialists and the steering group.
	Strong communication infrastructure	Moderate	The project had an open-minded communication culture. Lacking communication infrastructure	Good	Software tools or platforms are established to share information with internal or external partners
Continuity	UX guarding functionality	Good	15 minute rule applied throughout the process	Good	UX is placed as one of the performance evaluation criteria
	Customer involvement in development process	Moderate	Customers were not fully involved. This was explained through that customers are not capable of providing clear answers on development issues	Moderate	Discussions with customers are seldom found to lead to any concreteness. More feedback would be needed from sales-customer surface
	Selective recruiting of employees	Good	The development team was recruited with people that had previous knowledge from similar projects	Good	Projects are equipped with people that are seen suitable for that specific project

The results imply that a the larger contribution of the results is pointed towards aspects that are not directly about project management manners and behaviour, but rather towards things that are crucial in the management of the project transformation. In this sense, the findings support the conclusions of Whitty and Maylor (2009) that a new way of managing the development projects of complex systems is not needed. Furthermore, the results go partly along with the findings of Blindenbach-Driessen and van den Ende (2010) who state that management and leadership ways do not differ much themselves, but specific management practices do.

Most literature findings for the success factors for user-centric projects were seen to be also applicable to the case results. This implies that a substantial part of CSFs in user-centric projects in general and within the environment are also applicable for development projects within industrial complex systems. For example, the literature recommendations for the goals and objectives for a UX oriented project seem to go along with the case results. A strong basis for a project was seen to improve the visibility and credibility of UX in both cases similarly to the findings of Rosenbaum et al. (2000). The recommendations of Venturi et al. (2006) for providing usability goals and incentives were particularly emphasized in the case results, and are seen to make a more concrete evaluation of UX in the development process.

The case results under performance monitoring follow quite a similar path in contrast to the perceived CSFs in user-centric projects, although some differences did exist. Validation of customer behaviour or requirements mentioned by Frow & Payne (2007) was seen to be the most effective when gathering them from previous experiences or from multiple sources. Moreover, getting feedback only from a single customer or salesperson source was seen challenging in both case organizations, resulting often in a narrowed subjective opinion that was difficult to utilize within the development team.

The usability aspects were tested by both case firms. Testing was found to help checking whether the software or product suited the context of the firm or the industry. More specifically, both case firms mentioned that more comprehensive UX measurement and planning always require participation by the internal personnel of the company. This was justified with the higher level of needed competence in order to participate in the project requirement planning activities. This emphasizes the importance of having internal UX specialists, similarly to the findings of Vredenburg et al. (2002).

Similarly to the perceived similarities between the CSFs between project management and UX oriented project management, the importance of having good decision makers was valued equally important in both case organizations. Supporting the result made in the literature comparison, a project manager in one case mentioned that the fundamental leadership ways were seen not to differ between UX oriented projects and traditional

development projects. Due to the subjective opinions of the interviewees, a valid picture of the management competency level in this study context is challenging to get. Thus, most of the opinions were derived from inside the case company. This questions the transferability of the study results on providing any concrete conclusions on project management aspects in general.

On transformation aspects, a cross-functional development approach was seen successful in both projects, supporting the recommendations of Kotri (2011). This will require the customer experience managers to have great inter-functional skills and authority in the development process (Palmer, 2010, p. 204.) Similarly to the case results on project decision making, validating whether the development team was skilled enough is prone to biases due to the subjective opinions of the interviewees. Both case firms had laid a significant emphasis on taking into account the differing user needs as a beneficial way to keep the development customer-oriented. The results prove the importance of supporting user tasks mentioned by Hecker and Berger (2011).

Interviews with both case firms pointed out that concreteness and visible prototypes make a remarkable difference in the impact of the UX functions. They were seen helpful in getting a clearer picture of the UX benefits to the system, which makes it easier for the managers to evaluate that function or design aspect. Furthermore, it was seen to affect positively to the mindset of the frontline persons towards the development. These results imply that providing prototypes or other concrete examples could be a success factor in user-centric projects in industrial complex systems environment. This answers to the need for a better valuation of user experience pointed out in literature (e.g. Hirsch et al., 2004; Bias & Mayhew, 2005).

Both of the case firms scored only a moderate level on utilizing internal and external communication of design methods. In the case of Fastems, the communication between R&D and S&M were said to be lacking. This might have had an effect to the finding that customers were unaware of some important product design aspects. In the case of KONE, internal communication of test results was seen to increase the knowledge of salespersons towards the design aspects. These kinds of findings support the finding of Rosenberg and Kumar (2011) that the communication of design methods would be a critical success factor in UX oriented project management. A positive effect was seen also when having close customer relationships, enabling more collaboration in the design process. As opposed to this, the case findings did not provide straight answers to the “Good communication” criterion. One reason for this might be that the factor itself can be understood to express a really abstract aspect that lacks concreteness. The interviewees from both case companies pointed out that more communication towards the customer and users could be beneficial to getting the right customer need. The need

to build a communication bridge was emphasized during the first phases of the development.

Similarly to the recommendations of Schatz and Abdelshafi (2005), utilizing and learning from past experiences were found in both case companies to help constructing new ideas that would meet customer needs. The benefit of having a UX oriented culture is supported by the finding that at KONE, where the UX vision was integrated more than at Fastems into the organizational functions, the mindset of salespersons was shifted also more towards experiential factors during the sales process. However, it has to be mentioned that the customer base of Fastems is much more technical oriented, which has a crucial effect to the amount that a UX oriented mindset can be implemented within a company. A same finding applies also to the organizational adaptation of UCD. Based on these results, it can be suggested that a company should first be thinking of the needs and buying criteria of its customers before making any significant changes to the organizational changes towards a user-centric design approach.

Any significant boundaries that could be generalized for UX oriented project success were not resulted in the case studies. Moreover, the correct project duration and complexity and project team size were found to be more dependent on the context and nature of each project rather than universal recommendations. A frontline manager mentioned similar findings about the individuality of each sale situation. Baraldi (2010) also highlights the crucial effect of case-dependency. This questions the need of having any restricting factors that can be generalized to affect the successfulness of a project in CoPS environment.

Regarding project resources, the recommendation of e.g. Hecker and Berger (2011) of having sufficient and well allocated resources were supported by both case findings, seen to affect positively to the amount of cross-functional collaboration in the development program. Respectively, a lacking amount of given resources to the frontline persons was seen to prevent them from participating in the development project as much as the development project interest groups would have wanted. Systematic meetings and discussions were seen to lead good collaborative decisions on what are the most viable options for product design. A strong communication infrastructure in the form of open-mindness and communication tools was perceived useful when sharing information, especially in the case where there are multiple partners involved in the development project. This goes along the findings of Sobiesak et al. (2002) of having adequate communication infrastructure in multisite projects.

Similarly to the providing usability goals and incentives, having UX guard the functionality was a factor that was particularly emphasized in both case companies. It was seen as a way to keep UX visible and important throughout the design process. In addition, it was seen to help the salespersons to understand the real benefit of UX

clearer. This is an interesting remark since from earlier findings Hellman and Rönkkö (2008) were the only authors from the studied literature that mentioned UX guarding product functionality as one project CSF. Thus, laying UX related metrics as one key criterion against which the product design is evaluated has a particularly significant role in CoPS environment compared to UX oriented development project in general.

Involving customers in the development process – which was perceived as a success factor in five out of 15 earlier studies – was not found to create such positive results to the development project success in neither of the case companies. In the case of Fastems, the customers were not seen to provide clear answers on the complex issues that the development team was facing. In the case of KONE the discussions with the customers were seldom found to lead to any concreteness. A more efficient way to collect customer feedback was seen to be more general lists or background information of multiple projects about customer needs. Thus, customer discussions were found useful to ascertain that the right things are implemented. Furthermore, they were seen helpful in the development of the marketing material and sales argumentation. As a conclusion, the benefit of including single customers when designing product solutions can be challenged. A more effective approach is to utilize customers in the latter phases of development, such as when testing the system or crafting the sales arguments for the systems.

Most of the literature findings for the success factors for user-centric projects were seen to be applicable to the case results also in industrial complex systems context. However, some CSFs that were mentioned in UX literature were seen less effective in CoPS environment. Moreover, some recommendable actions were mentioned within the cases that were not distinguished by earlier literature. In order to give a more precise picture of the CSFs in CoPS environment, a modified version of the success factors in the FSM model should be presented (Table 17). Presenting a modified framework corresponds to two out of three ways to demonstrate theoretical contribution of a case study, expressed by Ridder et al. (2012, p. 9). Besides bringing an extension of extant theory in a new context, the framework refines existing theoretical perspectives and demonstrates a modification of critical success factors in CoPS environment.

Table 17. Critical success factors for user-centric projects in CoPS environment (concluded by the author)

Project attribute	Critical success factors from literature	Modification(s)
Goals and objectives	Strong business case/sound basis for project Target-group oriented strategy Clear realistic objectives Providing usability goals and providing incentives	
Performance monitoring	Validation of customer behaviour/feedback /requirements	

	Effective monitoring/control Competitive analysis/review sessions Adequate UX measurement tools	
Decisions-maker(s)	Executive/founder/management support Good leadership Competent project manager Authority to UX expertise	
Transformations	Cross-functional research/design approach Skilled/motivated staff/team Focus on supporting user tasks Providing prototypes/concrete examples	**New**
Communication	Internal/external communication of design methods Close customer relationship Good communication	
Environment	Past experience (learning from) UX oriented culture/mentality Organizational adaptation for UCD	
Boundaries		**Erased**
Resources	Sufficient/well allocated resources Systematic/appropriate training and meetings Strong communication infrastructure	
Continuity	UX guarding functionality in product development	
	Customer involvement at the end stages of development Selective recruiting of employees	**Modified**

The modified success factor list is similar to the earlier success factors list (Table 3) for the major parts. However, three main points were identified in CoPS context that were seen to differ from general UX project management recommendations. Providing concrete prototypes or real examples is seen really effective in making an impact with UX in CoPS environment. This was found to improve clarifying the benefits of UX to the managers and to other internal and external parties. This answers to the need for a better valuation of user experience pointed out in literature (e.g. Hirsch et al., 2004; Bias & Mayhew, 2005). These results imply that providing prototypes or other concrete examples can be understood as a success factor in user-centric projects in industrial complex systems environment.

The results prove the classical dilemma mentioned by McQuarrie (2008) of the challenges in integrating the R&D and sales and marketing departments. The engineers in R&D value more the technical functionality of the system, whereas the salespersons give a bigger emphasis on the understandability and straightforwardness of the system. Moreover, focusing too much on the UX aspects of the product can lead to a negative

impact if the customer is more oriented to more traditional system qualities such as technical reliability.

Pointing out negation of the results compared to the extant theory, any significant boundaries that could be generalized for UX oriented project success were not made within this study. Moreover, the results highlighted the importance of individuality of each development project and sales situation. One reason for the difference might be that the FSM model was originally made to identify factors that lead to project failures (Fortune & Peters, 1990; Fortune & Peters, 1995). The same challenges in pointing out any boundaries was shown also in the review of Fortune and White (2006, pp. 56-58). Only four out of 63 authors were mentioning some boundary as a CSF. Furthermore, each reference author was pointing out a different aspect for a project boundary, setting the results based on individual findings instead of common themes. Thus, mentioning any boundary that would apply to all development projects regardless of their size and complexity is not valid to make. Recent literature supports this by pointing out that the correct project duration and complexity and project team size is more dependent on the context and nature of each project rather than universal recommendations (Hyvari, 2006; Baraldi, 2010). The "boundaries" dimension will be erased from the framework to suit better to CoPS context.

UX oriented literature recommends involving customers to the development project for making the product more customer-oriented (e.g. Frow & Payne, 2007). The case results implied that involving the customers to test the end results is useful to ascertain that the right things are implemented. Furthermore, their presence was seen useful in sales argumentation development. As opposed to this, their involvement in the early stages of development was seen not to make any significant impact to product design or functionality. This was reasoned with the lack of knowledge among the customers to provide any usable solutions for the development team. One reason for this phenomenon could stem from the fact that complex systems involve much more dimensions and technicality compared to traditional goods. Thus, more emphasis was put on internal validation of customer behaviour from earlier development projects and collective customer feedback. To correspond to this finding, the success factor is modified to concentrate only in the end phases of the development project. The end phases describe the later phases of development when the main features of the product are designed and the goal is to for example test the software and design a way to deliver the values of the product effectively.

4.3 Discussion

The empirical part of the study provided some results of how the literature-based CSFs for UX oriented development project management are seen to reflect to single case

settings in a CoPS environment. The case-based success factors provided some refinements to the general recommendations for UX oriented project management practices. This chapter will continue that discussion by demonstrating a further implication to the proposed framework.

Regarding the impact of UX to the customer, in a CoPS context the customers seem to highlight more the practical functionality and usability of the system compared to the hedonic qualities. This finding is partially in line with the results of Abramov (2012) and Diefenbach (2011), which indicate that hedonic qualities are appreciated but are often neglected in purchasing decision justifications. On practical usability matters, the customers tend to appreciate functions that work in a similar way than the previous systems and increase the efficiency of their operations. The amount of different options may lead to confusion instead of increased system value. Very specific knowledge about customer needs and system preferences are critical when offering the product.

The after-sales and service aspects were highlighted in the results. They were mentioned as one of the main pillars when making a purchasing decision about a system. This implies that the project management of a developed system should not only be thinking about improving the usability aspects of the product, but rather give a substantial emphasis on providing a more comprehensive experience to the customer. Moreover, the results show that the companies in a CoPS environment should expand their mindset beyond UX towards the concept of CX, giving additional emphasis on the actions made before and after the actual sales situation. However, a solid implementation of UCD practices to the product itself should be done properly before implementing the system-related services. The best outcome will become from a good balance between both concepts.

Built on the groundwork of many earlier studies on New Product Development (NPD) best practices (Cooper et al., 2004b; Cooper et al., 2004c; e.g. Cooper et al., 2004a; Barczak et al., 2008), Barczak and Kahn (2012) present a framework that portrays NPD best practices across seven dimensions: strategy, research, commercialization, process, project climate, company culture, and metrics and performance measurement. The factors presented in this model are free of any industrial context or scope. Thus, the framework can be understood as a general set of best practices. (Barczak & Kahn, 2012, p. 294.) Comparing the list of CSFs identified within the results of this study to the general set of best practices it can be seen that many factors are included in both lists (Figure 13). Furthermore, it is possible to separate the list of CSFs between factors that are necessary for a successful NPD process in general (the blue boxes) and factors that are specific for UX centric projects in CoPS context (the red boxes).

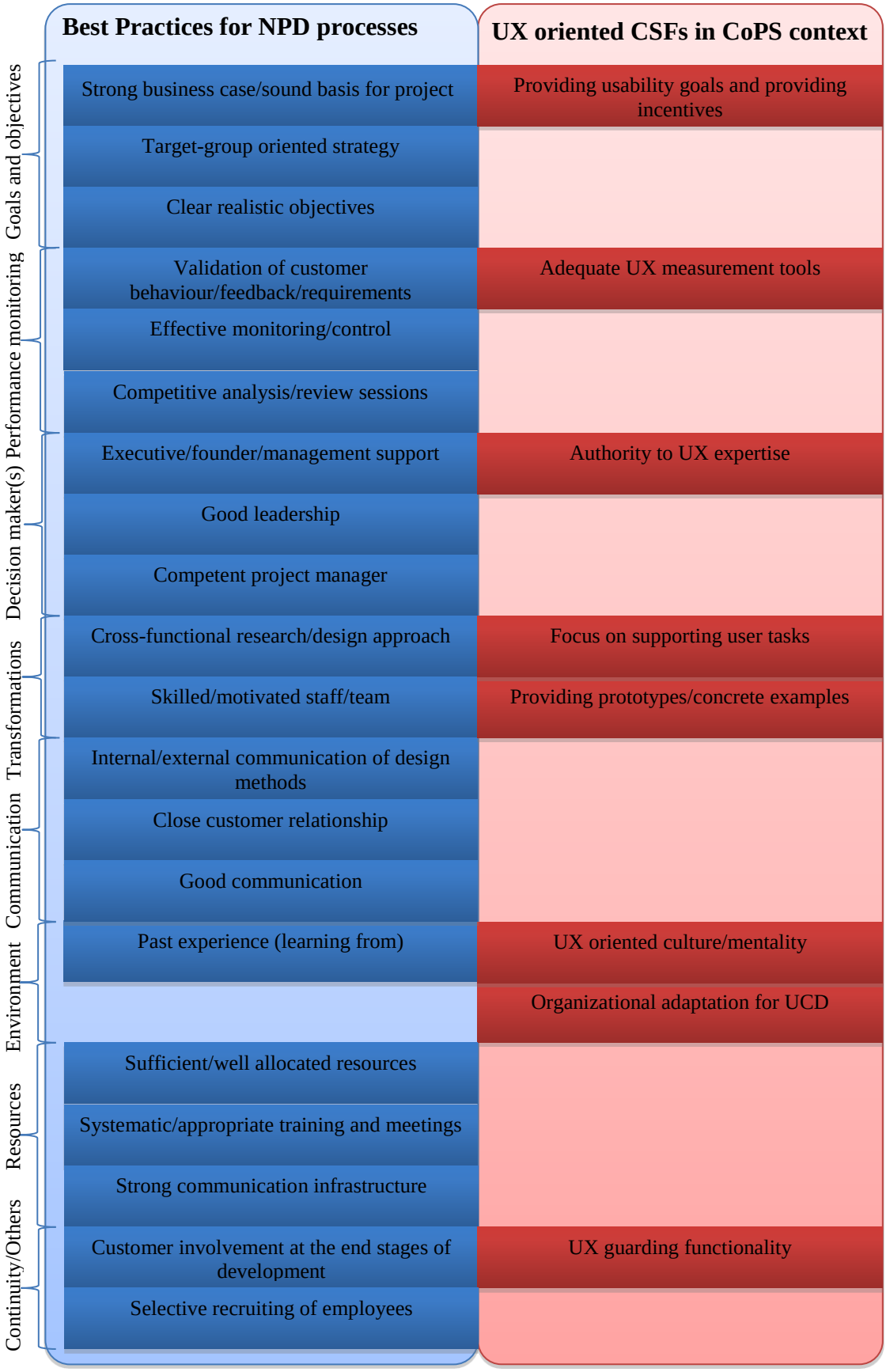

Figure 13. General Best Practices vs. UX oriented CSFs in CoPS environment

From a total of 28 CSFs in this study, all together 20 factors were listed also in the best practices for all NPD processes. These factors – e.g. support from senior management, close customer relationships, good communication – are not that heavily dependent on the development context. Thus, they can be understood as the fundamental factors that are required for an organization to establish a successful NPD process. When aiming to establish a user-centric design practice, it should be ensured that these factors are taken into account within the organization.

There were all together eight factors that weren't mentioned in the general list of best practices.

1. Providing usability goals and incentives
2. Adequate UX measurement tools
3. Authority to UX expertise
4. Focus on supporting user tasks
5. Providing prototypes or concrete examples
6. UX oriented culture or mentality
7. Organizational adaption for UCD
8. UX guarding functionality in product development.

These factors are the CSFs that exist in the research context in particular. Thus, they can be viewed as a toolkit for companies working in a CoPS environment that are aiming to establish user-centric design practices. Furthermore, the list can be separated between factors that are defined for each project individually and others that should be bound to the culture of the company in a larger scale (Figure 14).

Figure 14. Toolkit for UX success in CoPS environment

Changing the mindset of the whole company is ultimately needed for a long-term impact with user experience. This reflects to the sixth and seventh factor, UX oriented culture and organizational adaptation for UCD. Thus, achieving a level regarding these factors is also the most challenging task, requiring a solid support by the senior managers and also often some structural changes in an organization. However, for convincing the management of the long-term benefits of UX some good short-term results are required. A way of gaining short-term results is, for example, to conduct pilot projects made with UCD practices.

Providing usability goals and incentives and having adequate UX measurement tools are factors that are typically defined for each development project specifically but often require some preparation. Before the execution of a project the UX goals should be discussed so that the benefit achieved with UX would be understood by all people involved. Additionally, some metrics should be placed upon the goal for measure how the goal can be achieved. During the execution, the development team should be provided with an easy tool (e.g. a question list) to measure the UX abilities and give practical benefits (e.g. monetary bonuses) for achieving certain UX improvements.

Giving authority to UX expertise and enabling UX to guard product functionality are ways to secure that the decisions made with UX are affecting the whole development process. Depending on the context, a certain amount of UX specialists should be involved in the decision-making group during project planning and execution. Furthermore, evaluating the product with some UX criteria enhances the possibilities that the execution will be kept in a UX oriented way.

Focusing the development thinking on solving tasks of end users keeps the development more user-centric. In the early phases of development this can be achieved, for example, by gathering customer information from previous systems and with questionnaires. User testing is recommended when some concrete results can be presented and evaluated. Concrete examples or prototypes (e.g. paper prototypes) are recommended as a quick way of presenting some concrete results already to the managers and to the users.

As opposed to narrowing the thinking to the project-based and organization-based factors, the phenomenon should rather be understood as a dialogue between the short-term results and a wider impact. Short-term results are required to iteratively shift the organization towards user-centric practices. On the other hand, the long-term changes in the people and structure of the organization enhance the possibilities to achieve greater results with each new development project. Thus, considering every aspect of development is crucial when aiming to make a comprehensive impact.

5 CONCLUSIONS

"But you wouldn't clap yet. Because making something disappear isn't enough; you have to bring it back. That's why every magic trick has a third act, the hardest part, the part we call "The Prestige"."

5.1 Main outcomes of this thesis

The main goal of this thesis was to provide an overview of what effects user-centric design has on the management of product development processes in the complex systems environment. The theoretical overview was conducted to test the original theory for project management success factors made by Fortune and White (2005) in a UX environment. Furthermore, the empirical results made with two Finnish metal and engineering companies gave a reflection to the studied phenomenon in the complex systems environment.

Regarding the contribution of this case study, the results managed to bring an extension of extant theory in one research context. More specifically, it demonstrated the applicability of some project management CSFs in CoPS and UX environments. Besides grounding well-defined constructs in new contexts, the results also indicated a refinement of extant theory by presenting some modifications and refinements of existing theoretical perspectives for the research context (Ridder et al., 2012, p. 9).

The first objective was related to the applicability of project management success factors in user-centric design practices and more specifically within complex systems. The results indicate that a substantial amount of project management success factors can also be applied to a UX environment. These included fundamental competitive factors for an organization, such as leadership skills, a skilled development team, top management support, sufficient resources and good communication. However, the results differed from some specific management perspectives. The results go along with the findings of Blindenbach-Driessen and van den Ende (2010) who state that general management ways do not differ between different project contexts but specific management practices do. Table 17 illustrated an adapted list for the project management CSFs in CoPS environment.

The characteristics of complex systems led to modifying some of the previous findings about project management CSFs. The results expand the earlier recommendations of Rosenbaum (2000) for performance monitoring, implying that the nature of CoPS calls

for a closer collaboration between UX specialists and the internal staff of the company. As opposed to earlier results of Jain et al. (2011), the involvement of customers in the development process was not seen as effective in CoPS environment. Furthermore, joint discussions with the customers were seldom seen to lead to any concrete solutions that would be applicable in product development. This was reasoned with the amount of required knowledge to understand the system. As opposed to this, the customer perspective was seen valuable in processes that are not directly related to product design but rather to subjects related to testing and value delivery towards the customer. Internal validation of customer behaviour or a collective customer feedback system seem to be a better option for acknowledging customer needs in CoPS environment during the design of product characteristics.

Concreteness and real examples of the product characteristics are seen particularly effective in clarifying the benefits of UX, answering the needs expressed by Bias and Mayhew (2005) for a better UX valuation. As opposed to the earlier research considering the FSM model (Bignell & Fortune, 1988; Checkland, 1988), the results of this study do not see any benefit of including any restricting boundary that could affect the project outcome. As a conclusion, the boundaries dimension was erased from the modified list of critical success factors (Table 17). This table presents a refinement of existing project management CSFs in the CoPS context.

The second objective of this thesis was focused on analyzing how user-centric design reflects to the perceived value of user experience in the sales process of the system. The results implied that UX will affect positively to the perceived value of the product during the sales and purchasing process of the system. Thus, UX can be understood as a base for competitive advantage also within the industrial context of complex systems. Furthermore, the customers in the CoPS environment value the practical usability aspects more compared to the hedonic usability aspects of the product. Furthermore, customers tend to appreciate systems that function in a similar manner than the previous models. In this sense, the results go along with the results of Abramov (2012) and Diefenbach (2011) who state that hedonic qualities are appreciated but are often neglected in purchasing decision justifications.

The trend towards a service-based business model was highlighted in the results. It was mentioned as one of the factors that had a concrete effect to the perceived value of the system. When aiming to make an impact with UX, the mindset should be extended beyond the initial sales order of the system towards more service- and brand-related aspects. In order to analyze the significance of the results, the findings were compared with the framework of Barczak and Kahn (2012) for NPD best practices. As a result, the CSFs could be separated into ones that are part of a general set of best practices, and

ones that are more specific in the study context. This comparison made it possible to present a toolkit for UX success in the CoPS environment (Figure 14).

The results go partly along with the findings of McQuarries (2008) regarding the communication challenges between R&D and marketing department. Where the focus on the R&D department is on enhancing the functionality, performance and design of the actual system, the salespersons and marketing personnel give a bigger emphasis on the understandability and straightforwardness of the system. Furthermore, giving too much emphasis on UX-aspects in a sales situation was seen in some cases to have a negative impact on the sales outcome if the customer is more focused on the technical features. An open bi-directional communication channels between the divisions of the supplier and the customer are needed for a reliable customer-oriented design approach.

5.2 Limitations and further research directions

The case interviews gave some answers on how user-centric design was seen to affect the management of development projects. Furthermore, the results gave some answers on the impact of UX in the perceived value of the system during the sales and purchasing processes. However, due to the noted restrictions of the research method and the case material, the findings are prone to certain limitations. The sources of the limitations can be categorized under temporal, contextual, research method and research material constraints. The limitations will be reflected with Lincoln and Guba's (1985) evaluative criteria of four dimensions: credibility, transferability, dependability and confirmability.

The temporal state of doing this research might have had an effect to the outcomes. During the time that the material for this thesis was collected, user experience has been a global trend and enjoyed a lot of positive publicity. Additionally, both case companies can be considered to be keen on UX matters since they were participating in UX-focused development program UXUS. This might have caused that the image and importance of user experience was over-estimated when doing the research. Furthermore, the empirical results regarding the successfulness of the actions might have been distorted by the on-going UX trend. To improve the confirmability i.e. the degree of neutrality of the results, an alternative way could have been to conduct the study during a longer time period, producing a wider and more neutral perspective for the real impact of the phenomenon.

Due to the limitations given by the larger research program, the findings made with this thesis were mostly focused on the CoPS environment. The factors were compared with the general best practices in NPD processes. As a result of this discussion, the applicability of some factors could be expanded to a wider context. However, the results

lacked of bringing conclusions on the transferability of most of the UX specific factors that were mentioned in the toolkit for UX success.

The theoretical review of UX related literature was made solely by the researcher. The categorization and comparison of the literature-based CSFs were prone to the researcher's own interpretation of the factors' meaning. This was found challenging due to the limited amount of agreement among authors on the factors that influence project success. A more legit approach would have been to use another party for triangulation purposes. Furthermore, the relation of all of the CSFs between project management literature and UX related project management literature were always not consistent. The identified CSFs by Fortune and White (2005) were first and foremost affecting the end results of the project. As opposed to this, the impacts of the identified UX related success were much more focused on improving the integration of UCD in an organization or improving the perceived value of UX in the product. Thus, the impact of the CSFs identified within this study should be limited to improving the UX abilities in the product or development process.

The case method is always prone to certain limitations, such as a small sample or non-representativeness of the results (Siggelkow, 2007). The impact of both of these limitations was noted during the execution of this study. First, the results were derived from the subjective interview opinions of the practitioners. Hence, the dependability of the findings could have been shaped by the motives or interests by the respondents. Belonging in the same research program with both case companies might have diminished the general challenges of researcher-practitioner interviews (Myers & Newman, 2007, p.4). However, in some of the interviews with the customer the researcher was often seen as a representative of the supplier company instead of an objective analyst. This might have caused that the customer representatives did not want to express their true motives when explaining about the buying situation. Furthermore, the position of the interviewees might have affected the answers so that the rational buying criteria were overemphasized and the real motives were kept hidden. Second, the results could have selectively interpreted by the researcher so that the results go along with the original goals of the study, "Did this study get only the results that it wanted to get?" Thus, the own interests of the researcher could have lowered the degree of confirmability of the research.

Regarding the limitations of the research material, most of the interviews were held with the supplier company representatives. This might have led to a situation where the answers and conclusions were twisted towards the supplier company's points of view. Moreover, some of the interview material was not held by the researcher himself. Hence, the answers may have withheld some motives or interests that shaped the answers in a way that could not be noticed in the interpretations. Additionally, due to

the research limitations, the results of this brought viewpoints on user experience only until the supplier-customer surface. Thus, the results were mostly focused on bringing effects of user-centric design on the perceived value of the buyer of the system. A more in-depth approach could give more credible data of the effects of user-centric design to the perceived value of the user of the system.

The results were inconclusive about the relative importance of the expressed CSFs and were merely focused on providing answers of the perceived value of UX in general. Hence, the results did not provide any clear answers whether some specific methods or factors had more influence than the others to the perceived system value.

The research limitations of this study provide some valid suggestions for future studies. Due to temporal limitations, this study was mostly focused on bringing a momentary perspective of the phenomenon. A study that would explore the effects of UX with a longer time period could be interesting in analyzing the impacts of UX during different global trends. Another source for a future study would be to study the effects of UX in another industrial context. This would enable some reflections of the UX-based CSFs in another context than CoPS and give more valuable insight regarding the transferability of some results.

The results made tentative indications that the stage of the UX transformation inside a company affects the relative importance of each CSF. Thus, the relative importance of the factors could change within time when the company adopts user-centered design practices. An interesting idea for upcoming studies would be to distinguish the different stages of evolution that occur when a company is adopting UCD practices, and study, how does it relate to the relative successfulness of each CSF. Furthermore, the impact of firm characteristics is found critical when determining the CSFs (Blindenbach-Driessen & Van Den Ende, 2010). As an implication for future researches, the results of this thesis raise a need to study the impacts that the company size, industrial focus or organizational structure has on the evolution of the critical success factors in UX development.

This study was conducted only by using a case method. As a proposal for future studies, some quantitative methods could be integrated with the qualitative case interviews. This would provide another source of information to be used as the basis of the study. This would not only increase the credibility of the results, but it would also make it possible to study the relative importance and cause-of-effects of each CSF when aiming to adopt user-centric practices. Furthermore, such research method would help the companies to prioritize between different aspects when establishing a user-centric company culture.

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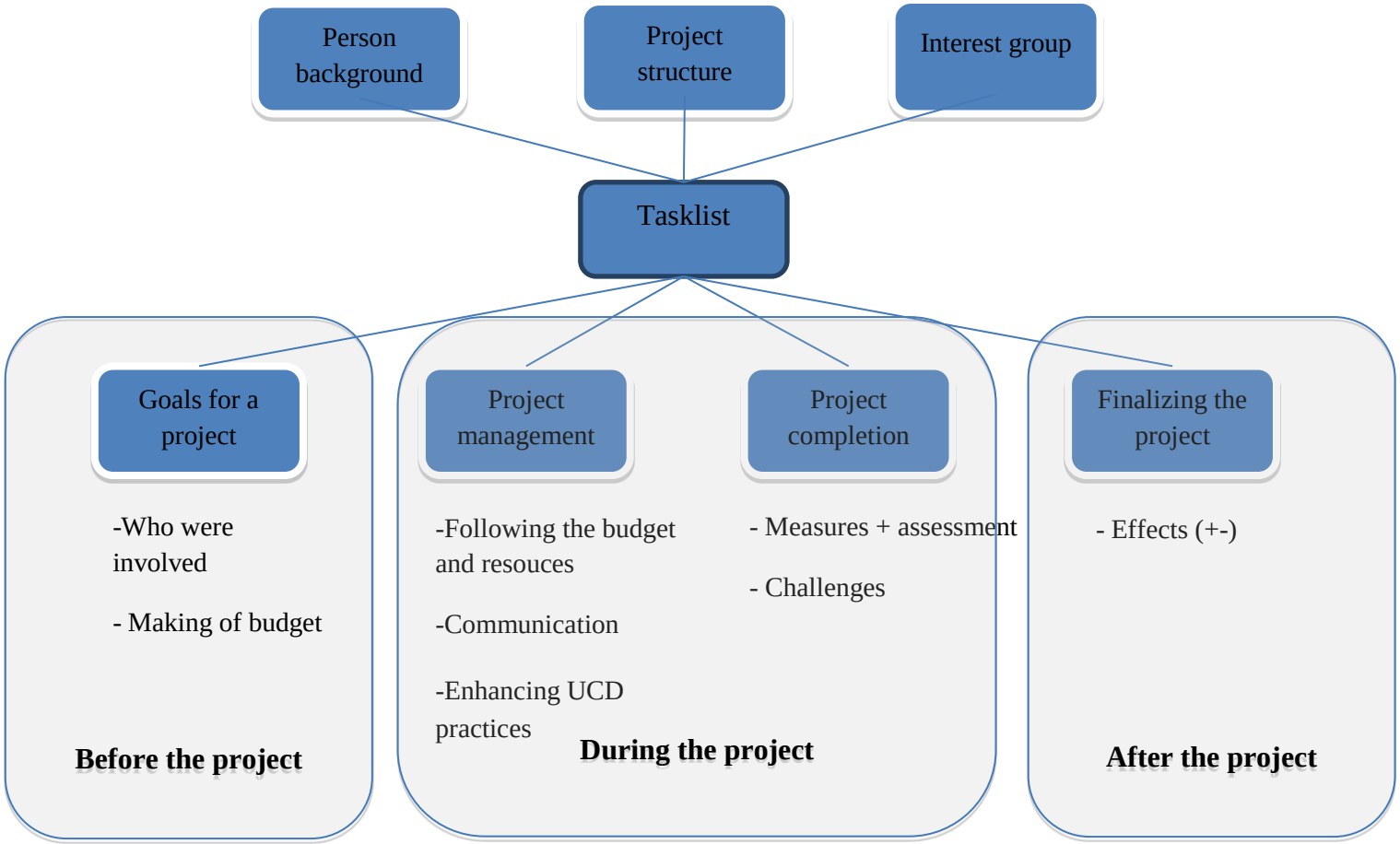
APPENDICES (2 PIECES)

APPENDIX 1. Interview with Fastems Oy Ab representative

1) Background of the interviewee
2) The structure of MMS5 steering group
   a) Which persons were involved in the steering group? How was the steering group formed?
   b) What goals did the steering group have regarding the MMS5 development program?
      i) How was user-centeredness acknowledged?
      ii) What would you think was the knowledge/preparedness for the steering group and project management to conduct such project?
      iii) User-centeredness as part of this program versus a more extensive aim to integrate UCD to company culture?
3) Working as part of MMS5 steering group
   a) Was MMS5 the first user-centric project? How was UCD shown in the management practices?
   b) Were user-centric factors tested or measured during the development?
   c) What central decisions and outcomes did the work in the steering group involve? Were some of these focused on improving the user-centeredness of the system?
   d) Was the external UX partner given power during the development?
4) Resources for UCD development
   a) What were the criteria of the steering group for giving resources to different aspects of development?
   b) Were there any direct resources given to UX oriented development aspects? Were they enough?
   c) With what ways did you ascertain that user-centeredness was in a focal position during the development?
5) Collaboration and communication
   a) Was the steering group in collaboration with other organizational division during its work?
   b) How would you rate the environment of the development project in regard of collaboration and communication?
6) What aspects of the organization (structure, culture, people) were perceived challenging during the development in regard of UCD?

APPENDIX 2. Interview with KONE Oyj representative



1) Background of the person

2) Structure/nature of the development projects

   i) What industry? What customers?
   ii) What scope? Which interest groups are typically involved?

3) The planning and beginning phase of a development project

iii) How are the goals for a project defined? Who are involved?
iv) How are the resources given to the projects? How is the budget allocated to different parts of a project?
v) Are certain practices in defining the project noted better than other practices?

4) Completion/transformation of a development project

b) Management
   i) Who are involved in making decision? Who else are involved in influencing the process?
   ii) With what ways are user-centric projects managed?
   iii) Are there some aspects considering the structure of culture of the company culture that has had a positive or negative impact to the process flow?
c) Completion/transformation
   i) In what kind of teams?
   ii) Who are involved in the concrete transformation of a project?
   iii) What aspects within a team have been found positive (or negative) affecting the end results?
d) Communication
   i) Which communication tools are used during a project? Are certain instruments found more useful than others? Why?
   ii) In which interest group you typically are in contact with? What kinds of things are discussed?
e) Customer/sales perspective
   i) Are the customers and sales and marketing representatives involved in the development?
   ii) What is their role in the development? How much power these persons have in the process?
   iii) Could you describe of any ways in managing and transforming a project that have a positive impact to the viewpoints or opinions of the sales and customer representatives?

7) What aspects of the organization (structure, culture, people) are perceived challenging during the development in regard of UCD?